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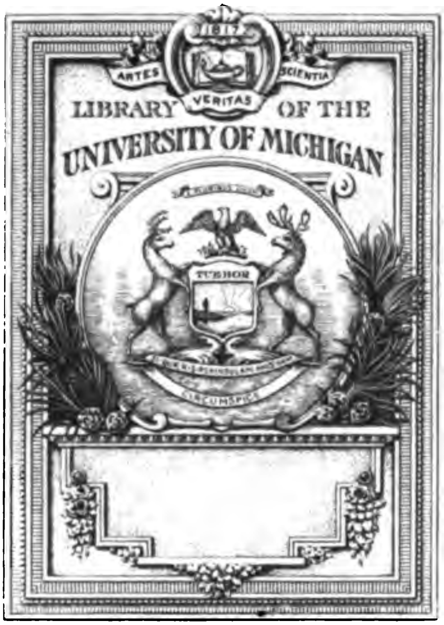
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FIRST BIENNIAL REPORT

OF THE

Michigan

LIVE STOCK SANITARY COMMISSION

FROM

ORGANIZATION TO MARCH 1, 1887.

BY AUTHORITY.

LANSING:
THORP & GODFREY, STATE PRINTERS AND BINDERS.
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STATE LIVE STOCK SANITARY COMMISSION.

MEMBERS OF THE COMMISSION.

H. H. HINDS, President,	STANTON.
C. F. MOORE, Secretary,	ST. CLAIR.
THOS. FOSTER,	FLINT.

STATE VETERINARIAN.

PROF. E. A. A. GRANGE,

STATE AGRICULTURAL COLLEGE,

LANSING, MICHIGAN.

REPORT OF THE STATE LIVE STOCK SANITARY COMMISSION.

To the Governor of Michigan.

SIR:—Under the operations of act 182, session laws of 1885, entitled, "An act to provide for the appointment of a Live Stock Sanitary Commission and a State Veterinarian, and to prescribe their powers and duties, and to prevent and suppress contagious and infectious diseases among the live stock of the State." Approved June 10, 1885.

The Governor appointed Thos. Foster, Genesee; H. H. Hinds, Montcalm, and Chas. F. Moore, St. Clair, a Board of Live Stock Sanitary Commissioners. Under and by virtue of the same act, the Governor appointed Prof. E. A. A. Grange, of the Agricultural College, as State Veterinarian.

The commission held its first meeting August 28, 1885, and organized by the election of H. H. Hinds as President, and C. F. Moore as Secretary. The above act was given immediate effect. The same legislature passed act 198, entitled, "An act to regulate and provide for the carrying, yarding, and feeding of so-called Texas cattle, while in transit into, or across this State, between the first day of April and the first day of November of each year."

This act, for manifest reasons, was not given immediate effect. As the purpose of this last named act is clearly "to protect the health of the domestic animals of the State from an infectious disease of a malignant character," it would become the duty of the Live Stock Commission to attempt its enforcement whenever it became operative. Previous to the date on which this last named act would become operative, and on September 8, Dr. Wight, Health Officer of Detroit, under the operation of Sec. 6, of act 182, before referred to, officially notified the commission of a serious outbreak of Texas fever among the milch cows of Detroit. This outbreak had been usual at about this season of the year for a number of years, and had caused a loss of thousands of dollars' worth of cows annually in Detroit, and was brought about by driving so-called Texas cattle from the Michigan Central stock yards to the pastures and slaughter houses in and about Detroit, while the disease-carrying animals were awaiting slaughter for beef. The particular manner of communicating this deadly scourge to our native cattle, is by infection and all of the droppings and exudations of these cattle carry the germs of this disease, and thereby the pastures, and even streets and commons over which these southern cattle pass, become infected, and nothing will kill the disease germ until the arrival of a hard frost, which immediately ends all danger for that season.

The commission met in Detroit in response to the notice of the Detroit

Health Officer above referred to, examined the sick cattle, caused *post mortem* examinations to be made by the State Veterinarian, whereby it was clearly determined that the contagion was Texas or Splenic fever, and as act 198 was not yet operative, they could do nothing to stay its ravages or prevent further introduction of Texas cattle. Through the public press and otherwise they called the citizens' attention to the dangers from the contagion, and suggested to them the wisdom of keeping their cattle within inclosures until the danger should have passed. The aggregate loss in Detroit from this outbreak, the local authorities set down at over two hundred cows, valued at ten thousand dollars.

Several outbreaks of hog cholera were reported to the Commission since its organization by the local boards of health and others, but as yet veterinary science has discovered no effective measures, either to cure or prevent outbreaks of hog cholera, and the commission have been unable to afford relief but have recommended careful sanitary and quarantine regulations, and as swine are raised in Michigan as a rule, on fenced farms and within inclosures, there is but little danger of an infectious disease like this spreading in this State, as there is usually no exposure of the hogs of one farm to swine plague upon an adjacent farm. Perhaps as great a single loss as any that occurred in the State from swine plague was sustained by the State itself in the valuable Berkshire herd at the Eastern Insane Asylum at Pontiac.

The existence of several cases of glanders among horses of the State has been brought to the attention of the commission by private individuals, by local boards of health, by the State Board of Health, and by the Governor. Glanders is a loathsome, terribly infectious and incurable disease, to which not only the horse and several other of the lower animals are susceptible, but even man himself. The State Board of Health furnish statistics of several well authenticated cases of death from this cause among the citizens of this State. Horses being exempt from the operation of Act 182 by section 23 thereof, this Commission has been prohibited from rendering any assistance in wiping out this pestilence among horses, the only avenue through which this disease is spread. The English theory, after repeated experiments and years of experience, is that the ox is not susceptible to glanders. This is the commonly accepted theory in this country, but under the operations of Sec. 6, local boards of health, are vested with authority to investigate and determine the existence of contagious and infectious diseases among domestic animals, and by Sec. 7 it is made the duty of the Commission to act at once on their report. In February last the Board of Health of Liberty township, Jackson county, acting with a veterinarian from Jackson, and another from Tecumseh, present as experts, determined that at the barns of one Brockway there were cases of glanders as follows: 9 horses, 80 sheep, and 12 or 14 cattle. This information was communicated to the President of the Commission by the local board of health and by the State Board of Health.

President Hinds and Secretary Moore proceeded to Brockway's at their earliest convenience. An extract or two from their report will give some idea as to the exposure of these cattle to glanders, provided cattle are susceptible to glanders. "The situation of affairs at the farm of Brockway were desperate in the extreme. * * * Four head of mature horse stock all evidently in the last stages of glanders and farcy, were on the first floor of a basement barn, and all were facing the threshing floor on which the hay was thrown to feed them, and the cattle stabled below.

* * * * A plenty of evidence of corruption thrown from the nostrils of these diseased brutes were apparent on the tools, harness, partitions, surroundings, and the threshing floor, and even the hay itself." The Commission, while believing that cattle were not susceptible to glanders, yet seeing such unlimited opportunities for exposure, and having before them the report of the veterinarians before referred to, decided to send the State Veterinarian to kill animals and make *post mortem* examinations, which was accordingly done. The *post mortems* determined that the horses had glanders, but that the cattle were free from it, showing again pretty clearly that cattle, although exposed to glanders in the most extreme manner, fail to be affected with this disorder.

Texas or splenic fever has caused greater loss in this country and in this State among cattle than all other contagious and infectious diseases combined. This disease, while very destructive to our native cattle and fatal in the majority of cases attacked, is not communicable from our native cattle. In other words, one of our native cattle will contract the disease from contact with, or passing over grounds occupied by the Texan, and will sicken and die in the midst of our herds, and no animal will take the disease from him, but let the Texan come in contact with a herd of our cattle, and he will poison the whole lot even though he is apparently well himself. So the remedy for prevention of loss is apparent, and that is the Texan must not be allowed in any car, yard, street, or pasture where our northern cattle are permitted to enter or pass. Nothing less than that affords protection to our native cattle against this deadly disorder. It was hoped by this commission that during the year 1885 the leading railroads in the State would comply with the requirements of act 198, and brand all cars used in carrying these south-western cattle. None of them, however, complied, and not a car has yet been branded and lettered as the law directs, although tens of thousands of these disease-carrying cattle are carried across our State yearly by our railroads, and thousands of them are yearly slaughtered for beef in our State. The commission met early in the spring in Detroit and made arrangements whereby, both at the M. C. yards and at King's yards, these cattle could be isolated when handled there, as is contemplated by law. The commission hoped through the Governor, the Commissioner of Railroads, and farther endeavors on their own part to get the railroads to comply with the law, and the President of the commission was directed to consult with these parties and bring about the desired result, and thereby perhaps prevent an outbreak of Texas fever in the State the past summer.

On May 21st the Commissioner of Railroads addressed the following circular letter to the managers and superintendents of Michigan railroads:

STATE OF MICHIGAN,
COMMISSIONER OF RAILROADS.
Lansing, Mich., May 21st, 1886,

To Managers and Superintendents of Michigan Railroads:

GENTLEMEN—The Live Stock Sanitary Commission of this State has this day filed a complaint with this office, "that no railroad in this State has complied with the provisions of act No. 198, session laws of 1885, entitled 'an act to regulate the carying, yarding and feeding of so-called Texas cattle,'" etc., and that by reason of such neglect, the danger is now imminent of the introduction of that fatal malady commonly known as "Texas fever" among the cattle of this State, and particularly among the milch cows of Detroit, where it is authoritively stated that more than $10,000 worth of cows during the last year perished from this disease alone.

I cannot too earnestly call your attention to the provisions of the law above referred to, and urge your immediate compliance therewith.

The interests of the carriers, and the citizens of the State are alike in jeopardy by failure to utilize the most stringent methods for the prevention of the dreaded fever among the cattle in this State.

It is my duty to energetically coöperate with the Sanitary Commission in the enforcement of the law, and I trust that it will not be necessary to resort to more active measures than this notice, in order to secure compliance therewith.

Please acknowledge receipt of this circular, and advise me of your action with reference to the same.

Respectfully yours,

WM. McPHERSON, Jr.

Commissioner of Railroads.

The railroad managers resisted pressure well, and none of them complied with the law in the slightest particular.

In the latter part of June the Governor called the Commission togather in Detroit to consult as to what course to persue to prevent an outbreak of Texas fever at Detroit the past season. The conference resulted in the commission appointing, on the recommendation of the Governor, Ben. J. Gibbons of Detroit as agent of the Commission at Detroit for the season, at a salary of one hundred dollars per month, and also in delegating to President Hinds of the Commission the duty of establishing and publishing such rules and regulations as to the movement of Texas cattle from the stock yards to the slaughter houses, fixing lines of streets over which they should pass, etc., as would tend to reduce the loss of native cattle from Texas fever to the minimum.

The rules and regulations which were thus established and duly posted conspicuously, and circulated among interested parties and published in the Detroit papers, is herewith attached, as follows:

RULES AND REGULATIONS.

Whereas, By Act 182, Session Laws of 1885, it is made the duty of the Live Stock Sanitary Commission to protect the health of the domestic animals of the State from all Contagious or Infectious diseases, and for this purpose it is authorized and empowered to establish, maintain and enforce such quarintine, sanitary and other regulations, as it may deem necessary, and

Whereas, The driving of so-called Texas Cattle, or cattle raised south of the 36th parallel of north latitude, and that have not been kept at least one winter north of that latitude, is exceedingly dangerous to the health of all northern cattle that may chance to come in contact with them, or that may pass over the same streets traveled by the southern cattle referred to.

It is hereby ordered by the Live Stock Sanitary Commission, that all cattle that cannot be absolutely identified as cattle that have passed the previous winter north of the 36th parallel of north latitude, shall be handled and driven from the Stock Yards at Detroit to the various Slaughter Houses only upon the following streets, viz.:

FROM CENTRAL YARDS.

Dix Road and Dix Avenue, Baker Street, Twenty-first Street, from Baker Street to Michigan Avenue, Seventh Street, from Baker to Michigan Avenue, Sixth Street, from Baker to Locust Street.

FROM KING'S YARDS.

Down Twelfth to Grand River Avenue, to Michigan Avenue, down Michigan Avenue to Foundry Street, up Grand River to Woodward Avenue, to Larned Street, to Riopelle Street.

None of the above specified cattle shall be permitted to be driven to pasture or to any other yard or barn than is connected with the various slaughter houses.

All owners of northern cattle are hereby cautioned and warned against using, and are directed not to use for moving northern cattle, any of the above named streets or portions of streets designated for driving Texas Cattle until the first day of November next.

By order of the Live Stock Sanitary Commission.

H. H. HINDS,
President of Commission.

Dated Stanton, Mich., June 30, 1886.

Agent Gibbons's services were continued, owing to mild weather, until Nov. 1st. The cost to the State in inaugurating and maintaining the precautionary measures above referred to, was in round numbers, $600, which amount might have been largely saved to the State if the railroads had complied with the law and brought these Texas cattle to Detroit only in branded cars, whereby they could have been identified on arrival, and it certainly could have been saved to the State if, in addition to transporting them to this State only in branded cars, the final clause of act 198, which reads as follows: "This act shall not prevent the driving of cattle direct to slaughter houses from the cars or pens," were eliminated from the law. The results reached by the course pursued by the Board are summed up by the final statement, that four cows only, had Texas fever in Detroit the last year, from which they all died, and in each case it was clearly shown that the owners disobeyed the plain orders of the Board by allowing their animals to feed on the forbidden streets, and right under the warning placards. The very interesting and instructive report of Special Agent Gibbons, showing something of the workings of the system at Detroit and the magnitude of the southwestern cattle trade at that point, is herewith appended and published in the appendix and marked exhibit "A."

The numbers of so-called Texas cattle handled at Detroit this year was not an unusual one, the trade being simply normal, and uninfluenced by any unusual outside considerations. The trade in this class of cattte heretofore in Michigan has been confined almost exclusively to Detroit, other cities buying foreign cattle, purchasing principally in Chicago and west. This condition of things is now, however, about to be entirely changed. The existence of hundreds and thousands of cases of contageous pleuro-pneumonia among the cattle stock of Chicago, to which more particular reference will be hereafter made, have made it necessary to establish a prohibitory quarantine against the importation of any and all cattle, to this State from Chicago for any purpose whatever. This quarantine in all human probability cannot be safely raised for many months to come. In this condition of cattle affairs not only Detroit, but a score of other Michigan cities will naturally turn to this southwestern cattle trade as the source from which to draw their cattle supplies and under existing lack of compliance on the part of transportation companies with plain provisions of law coupled with the provisions of the law itself, permitting the driving of these cattle directly from the stock yards to slaughter houses, and we have to contemplate a condition of affairs threatening imminent danger to our cattle interests, not the least of which is the placing of our native cattle in cars and yards that have been previously used for transporting and yarding Texas cattle, and in the absence of lettering and branding, as the law directs, leaves the owner of our native cattle without any means of discovering the danger. The placing of an agent of the commission in each city liable to receive a car-load of Texans, while being very expensive, would hardly protect our cattle industries, particularly from danger from infected cars. In this connection it is proper to state that in order that no railroad management should assume that the action of the Commission at Detroit furnished a proper way to protect the cattle industries of this State without compliance with the law on the part of the railroads, the Commission, on the approval of the Governor, on August 9th issued the following letter to the railroads most likely to be engaged in this traffic in this State:

"*To Presidents and General Managers of Railroads doing business in this State:*

"GENTLEMEN—The impression seems to obtain that the State Live Stock Sanitary Commission, by the issuance of the inclosed circular and the posting of placards bearing same information, have devised a plan whereby the impending danger of an outbreak of Texas cattle fever may be averted and prevented in this State, without any compliance on the part of Railroads with the provisions of Act 198, Session Laws of 1885, entitled "An act to regulate the carrying, etc., of so-called Texas cattle." We desire to inform you that it is clearly the opinion of the Live Stock Commission that the law referred to is necessary to the successful prevention of outbreaks of Texas cattle fever in this State, and that its provisions should be strictly complied with by all Michigan railroads, and that the Commission deem it their duty to call upon you to comply at once with the provisions of law referred to. Any damage that may arise to Michigan cattle interests from Texas cattle fever in the future may fairly be chargeable to the negligence of the railroads in failing to comply with plain provisions of law. We wish it distinctly understood that the issuance of the inclosed circular in no wise is intended to relieve the railroads from strict compliance with all provisions of law or from any responsibility under the same.

(Signed,) H. H. HINDS, *President.*"
C. F. MOORE, *Secretary.*

By far the most destructive of all cattle diseases is contagious pleuropneumonia. In fact in some countries, or sections of country, the cattle industries have had to be abandoned on account of its ravages, and all countries where cattle are grown the most stringent quarantine regulations are adopted to guard against its introduction. The simple announcement of an outbreak of the dread scourge paralyzes all cattle traffic in the region in which the disease is said to exist. This is an exotic lung and pleuro disorder, and was imported to this country some forty-three years ago. It is very fatal in its character, and it may be said to be practically incurable. The percentage of susceptible animals in any given herd or locality is so large that an exposure practically dooms all cattle to death that are exposed. It is both infectious and contagious, and is exceedingly insidious in development, and variable in its attacks and developments in different animals.

This is well illustrated by the fact that in the slaughtering of some thousands of so-called well cattle in Chicago, in November and December last, that had been exposed to pleuro-pneumonia, it was found upon post mortem that fifty-seven per cent of them had the disease. The only way thus far discovered to arrest an outbreak of pleuro-pneumonia is to summarily destroy all exposed animals, whether diseased or not. Michigan has been so fortunate as to escape any outbreak of contagious pleuro-pneumonia to the present time, although several western States have been visited with the malady. Next to an actual outbreak of the disease in a locality, in the disturbance of cattle interests, is the official promulgation of the existence of the disease in a certain herd. Sec. 6 of act 182, as before referred to, makes it the duty of local boards of health to determine as to outbreaks of contagious animal diseases, and twice in this State have local boards of health formally declared the existence of contagious pleuro-pneumonia in their respective townships during the last year. In Sebewa township, Ionia county, and in Berlin township, St. Clair county, the details of which are substantially as follows: On January 29 the President of the commission, Mr. Hinds, was notified by the local board of health of Sebewa, Ionia county, that a case of pleuro-pneumonia existed in the herd of one Halliday, at Sebewa. On arrival at the premises Mr. Hinds found an imported Jersey cow suffering from what appeared to be an acute case of tuberculosis, and there seemed to be an entire absence of indications of pleuro-pneumonia. As to the chances of exposure, so far as this animal was concerned, it transpired that the cow had been imported two years previously by Hiram Walker and Sons, Detroit, and had been kept in their herd, near Detroit, till last November, when Halliday purchased her, and she had been at his farm since, giving no chance for exposure. So much local feeling was apparent in the neighborhood that Mr. Hinds thought best to call the State Veterinarian, who, upon a careful examination, pronounced it a case of tuberculosis that would probably terminate fatally at an early date. The animal died March 2, and the post mortem determined the truth of the State Veterinarian's previous diagnoses. On December 2, Mr. Hinds was notified by the local board of health of Berlin township, St Clair county, that three cases of pleuro-pneumonia existed in the herd of Wm. Powers, of that township. On the following day Messrs. Hinds and Moore, of the commission, reached the place of Powers and found the country quarantined, and local excitement among the community at fever heat. The following is taken from the records of the commission in reporting this case: "The supervisor of the township, Mr. Albert P. Wheeler, and many other interested citizens and residents of the neighborhood met with the commission at the farm. It was the unanimous statement of all these people that no foreign cattle from any State or country had probably passed this farm, or been in contact with these cattle, for the last five years. The cattle stock of the farm consisted of three very lean cows, and a yearling heifer in fair condition. To particularize, they were an old red cow; an old black, with little white, cow; a middle aged roan cow, and a blue roan yearling. The cattle were in a very poor shed stable, that had recently been repaired some by battening the cracks, and by stopping some holes with straw. The cattle seemed very poor and very hungry, and were greedily eating some dry cornstalks.

They had evidently received no hay nor grain this year, and from all appearances, had lain on the bare ground of the stable without straw until recently. The old red and the roan cow, as well as the yearling, seemed to be entirely well but nearly starved, and showed general neglect. The old black cow seemed sick, but was under same conditions as the others. The owner said that she had been much worse, and as she was eating and drinking freely it seemed apparent that with proper care and comfortable quarters she would soon be well. All reports agreed that the cattle were well up to about a week previous, when extreme cold weather came on, when they all got sick at once. From all the above it was the unanimous conclusion of the Commission that no pleuro-pneumonia nor other contagious disease existed among these cattle. That they were simply suffering from exposure and neglect and that they had taken severe colds during the sudden change from mild fall to extreme cold winter weather, and that a change to proper conditions would soon restore them to a healthy condition. A herd of cattle just across the road, under proper conditions, were found to be in fine thrift and apparently perfect health. It was decided by the Commission unnecessary to send the State Veterinarian to examine these cattle."

These alleged cases of pleuro-pneumonia as well as glanders among cattle, as determined by different local boards of health, have been carefully cited, and they show clearly that the placing of the authority of determining the existence of these contagious animal diseases in the hands of local boards composed of gentlemen inexperienced in animal diseases, not only becomes expensive to the State itself, but causes disturbance of traffic by the establishment of local quarantines. If section 5 of act 182 required parties to report directly to the commission, and section 6 were repealed, these difficulties might not so often be encountered.

The discovery of thousands of cases of contagious pleuro-pneumonia, scattered in over a quarter of a thousand different places in and about Chicago last fall, presented a danger that very seriously threatened our cattle interest. This subject engaged the careful consideration of the commission and of the Governor, and leading stock growers throughout the State were consulted with.

At a meeting in Detroit, October 13, at which the Governor was present, it was decided to send Mr. Hinds to Chicago at once to make full investigation, and report facts and recommend such action as he thought would best meet the exigencies of the occasion. Mr. Hinds reported to the Governor and full board, on October 26, stating the situation, and recommending a quarantine against Chicago. The result of the meeting was that, as the Governor was disinclined to issue a quarantine proclamation until all other reasonable expedients had been resorted to to protect our cattle interests, the Board, in consultation with the Governor, decided to appoint an agent in Chicago, for a few weeks, and watch shipments and collect facts regarding the cattle now coming to Michigan from Cook county, Illinois. Mr. Ira H. Butterfield, of Lapeer, Michigan, was accordingly appointed. Special Agent Butterfield's report is herewith published in the appendix, and marked exhibit "B." It was also decided at the meeting above referred to that the Board should be fully represented at the forthcoming live stock and sanitary conventions at Chicago, knowing that this subject would be the engrossing business of these meetings.

The entire Board and special agent Butterfield attended these conventions. A meeting was also held in Chicago at this time, attended by all Michigan stock growers then in Chicago, say a score or more, and it was the unanimous opinion of this gathering that a quarantine proclamation should be immediately issued against Chicago. These facts were reported to the Governor in detail, both orally and in a written report, by Mr. Hinds, and at some date between Nov. 20 and 25 (the document is not dated) the Governor issued the first cattle quarantine proclamation ever issued in Michigan, and was as follows:

PROCLAMATION!

EXECUTIVE OFFICE,
Lansing, Mich.

WHEREAS, Pleuro-pneumonia, a contagious disease, is now prevailing among the cattle in the county of Cook, in the State of Illinois;

AND WHEREAS, Large numbers of cattle are being brought into this State from said county of Cook, and there is danger that said disease will be communicated to, and become prevalent among, the cattle in this State;

NOW, THEREFORE, To guard against such danger, and in accordance with the provisions of Act No. 182, of the Session Laws of 1885, of this State, being "An act to provide for the appointment of a State Live Stock Sanitary Commission and State Veterinarian, and to prescribe their powers and duties, and prevent and suppress contagious and infectious diseases among the live stock of the State," it is HEREBY ORDERED that no cattle shall be brought from said county of Cook, State of Illinois, into this State to be kept for feeding, or to be slaughtered therein, which have such disease, or have been exposed to the same.

On and after the first day of December, 1886, one or more of said Commissioners, or a competent veterinarian appointed by them, will remain in the city of Chicago for the purpose of inspecting all shipments of cattle consigned from said county of Cook to local points in this State, and no cattle shall be shipped into this State as aforesaid from said points, without a written certificate and permit from one of said Commissioners or veterinarian so appointed.

RUSSELL A. ALGER.

By the Governor:
H. A. CONANT, *Secretary of State.*

It will be observed that this proclamation required that a veterinarian or a member of the Board remain constantly in Chicago on and after Dec. 1 to examine all cattle seeking shipment thence to this State. The commission did not think these precautionary measures would protect our cattle industry, and, therefore, did not send a veterinarian to Chicago, nor go there themselves, as contemplated by the proclamation. They were unanimously of the opinion that a prohibitory proclamation was the only measure that promised us protection. The commission, therefore, addressed the following communication to the Governor:

To HON. R. A. ALGER, *Governor of Michigan:*

SIR: We have the honor to report that contagious pleuro-pneumonia exists to an alarming extent among the cattle of Cook county, Ill., and that examination by skilled veterinarians has determined the disease existing among cows and other cattle running at large upon the commons in and about Chicago. That so many diseased animals have been found at considerable distances from each other leads forcibly to the conclusion that there is a strong probability that the bulk of the cattle stock of Cook county, Ill., have been exposed to contagious pleuro-pneumonia.

We have also to inform you that veterinary surgeons, upon the most careful examination, under the most favorable circumstances, with each animal tied separately, are unable to determine anywhere near all the animals that are affected with this disease, and that in case of car lots of cattle running in stock yard pens it would be practically impossible for them to determine anything about the number of animals in any given lot that might be suffering from this disease, and farther, that no veterinarian or other person has any means for determining from examination whether or not an animal has been exposed to contagious pleuro pneumonia. In view of the above it seems to us impossible to devise any system of inspection by which it can be determined which particular cattle coming from said county of Cook it would be entirely safe to admit to our State, and therefore we say that absolute safety to our great cattle interests from that direction can only be secured by absolute refusal to admit any cattle to our State from Cook county, Ill.

We believe that an emergency exists that admits of the exercise of all the powers of the executive, and all other authorities in our State to prohibit the introduction of any cattle to our State from Cook county, as aforesaid.

(Signed), H. H. HINDS,
C. F. MOORE.

In response to this the Governor informed the commission that he would issue another proclamation stipulating such restrictions as might be required by such rules and regulations and orders as the commission might adopt regarding the admission of neat cattle from Cook county, Illinois. The commission met on Dec. 7 and 8, and adopted the following preamble and rules and regulations:

Whereas, Contagious pleuro-pneumonia has been found to exist among large numbers of the neat cattle of Cook county, Ill., and in several different places, and quite widely separated, in and about Chicago; and,

Whereas, The killing test now going on among the affected and exposed cattle by the Live Stock Sanitary authorities of Illinois is demonstrating that substantially one-half the cattle that have been exposed, and are to all appearances well, show upon slaughter that they are affected with contagious pleuro-pneumonia; and,

Whereas, As a matter of fact, a herd of cattle are now under quarantine at the Transit House barn, right at the gate of the Chicago stock yards.

Now, therefore, In the judgment of the Live Stock Sanitary Commission of the State of Michigan an emergency exists threatening serious damage and great loss to the great cattle interests of Michigan, and it is hereby *ordered* by said Live Stock Sanitary Commission, created and organized under and by authority of act 182, session laws of 1885, which declares in substance and language as follows, viz: "It shall be the duty of the Commission to protect the health of the domestic animals of the State from all contagious or infectious diseases of a malignant character, and for this purpose it is hereby authorized and empowered to establish, maintain, and enforce such quarantine, sanitary, and other regulations as it may deem necessary.

That from and after this date the importation of any and all neat cattle into this State from said county of Cook and State of Illinois is hereby prohibited until further orders by this commission, under such pains and penalties as is provided under act 182 as aforesaid.

It is hereby further provided and ordered, That no neat cattle in transit across this State from said county of Cook, State of Illinois, shall be unloaded and fed excepting in what is known as the Texas yards, at the Michigan Central stock yards, in the city of Detroit, county of Wayne, and it is also *ordered* that these yards as aforesaid, be devoted to the feeding of through cattle only, and that no other cattle be admitted to them.

On December 8th, the Governor issued his second quarantine Proclamation, which is as follows:

PROCLAMATION !

Executive Office, Michigan,
Lansing, December 8, 1886.

Whereas, Reports show that contagious Pleuro-pneumonia has been found to exist amongst the cattle of Cook county, Illinois, to a much greater extent and covering a much larger territory than had heretofore been supposed, as shown by the fact that large numbers of cattle are being killed, including not only those which are known to be affected by the disease but that are supposed to have been exposed to the same within said county of Cook;

And whereas, It is of the utmost importance to the cattle interests of the State of Michigan that every precaution possible should be taken to exclude such disease from this State;

And whereas, In the judgment of the Live Stock Sanitary Commission of this State, established by Act No. 182 of the Session Laws of 1885, the precautionary measures hereinafter named ought to be adopted;

It is hereby ordered, in accordance with the act heretofore referred to, that hereafter and until this order is countermanded, no live stock shall be shipped to any place in this State from said county of Cook, in the State of Illinois, either for feeding, slaughtering, or other purposes, and that all cattle shipped through the State shall not be unloaded and fed within the State except at such points as will not expose other cattle.

RUSSELL A. ALGER.

By the Governor:
H. A. Conant, *Secretary of State.*

The situation at Chicago so far as the cattle industry of the country in general and this State in particular are concerned shows no improvement. A few thousand cattle have been slaughtered in distilleries and elsewhere but thousands of diseased and exposed cattle are still scattered in various parts of the city, and there seems to be no well founded hope that the disease will be stamped out at Chicago for a long time to come. The desire of the cattle growers of the State, that was concurred in by the Governor and Legislature, that Congress would, at its present session, pass the so-called "Miller bill," the immediate purposes of which is to set on foot proper national machinery to stamp out contagious pleuro-pneumonia in the United States seems unlikely to be realized, in which event it seems to be an inevitable necessity that for the next two years at least we shall be compelled to try and protect our great and constantly growing cattle industries by a rigid maintenance of quarantine regulations against all infected localities. Should an out-break of this exotic animal disease, for the existence of which in this country Michigan nor none of its citizens are in any way responsible, occur in this State, it will undoubtedly be the best and only safe policy to strike an imaginary line around the diseased center sufficiently comprehensive to inclnde all the diseased and exposed cattle, and kill all within the line without hope of assistance from national authority.

The Commission desire to say that in the pursuit of their duties as laid down in the laws under which the Commission was created they have not had the advantage of following the precedents established by better men who had preceded them. This class of legislation is new to this State and practically new in this country. The Commission have been compelled to meet all questions presented to them, affecting the health of our domestic animals and apply to their solution their best business judgment. The have acted in all cases promptly and without standing upon the order of their going, waiting for neither daylight, wind nor weather, and have been both storm-bound and wrecked in pursuit of their duties. While the Commission have found it necessary to travel somewhat extensively, many miles of which have been made on foot or in open vehicles in extremely inclement weather, yet they have the satisfaction of being able to say that the gentlemen with whom they have done business have invariably been desirous of doing everything in conformity with law and in a way to protect the stock interest of the State.

The relations of the Board with Prof. E. A. A. Grange, State Veterinarian, with whose appointment they had nothing whatever to do, have been of the most cordial and pleasant character. The Commission have found it necessary to call upon Dr. Grange in several instances to visit several parts of the State to render expert opinions, on which the Board might base its actions, and in every case where a post mortem was resorted to the truth of the doctor's opinions was clearly established.

The interesting and instructive report of the State Veterinarian, Prof. Grange, is herewith forwarded, and particular attention is called to his suggestions and recommendations.

H. H. HINDS,
C. F. MOORE,
THOS. FOSTER.

REPORT

OF THE STATE VETERINARIAN TO THE MICHIGAN LIVE STOCK SANITARY COMMISSION.

OFFICE OF THE STATE VETERINARIAN,
Lansing, Mich., March 5, 1887.

To the President Michigan Live Stock Sanitary Commission:

SIR—I beg to submit the following report of investigations made by me concerning certain contagious and infectious diseases of live stock, since my appointment as State Veterinarian, up to the present time. On the 9th of Sept., 1885, I was called upon to investigate a disease familiarly known as Texas fever, which was said to be causing sad havoc among certain cattle in the city of Detroit. On my arrival there, I learned that some cattle from infected districts of the Southern States had been pastured on commons in the suburbs of the city, and had also been driven along several avenues and streets, to slaughter-houses in distant parts of the city, and that native cattle were affected with some malignant disorder in several localities. In company with Dr. Wight, health officer of the city, Mr. Lane, Meat Inspector, and yourself, I visited some of the afflicted animals, and found a number presenting the characteristic symptoms of Texas fever; but still further to satisfy myself as to the existence of the malady, I embraced the opportunity of holding several autopsies, when various lesions of the complaint were plainly exhibited, and I reported my finding to the Commission.

At this point I would like to say a few words concerning observations, which have been made relative to the dissemmination of the virus of this disease, during the past few decades.

First, it has been frequently demonstrated that cattle brought from certain Southern States during the spring, summer, and early autumn months of the year, are capable of conveying to Northern native cattle a disease which is of a very fatal nature, and at the time of the distribution of the poison, the Southern native cattle may appear to a casual observer to be perfectly healthy. Yet so susceptable to the disease are many Northern cattle, that it is only necessary for them to be driven across the trail of their Southern neighbors and their fate is sealed; so to prevent the invasion of this disease among Northern natives, the precaution of not allowing them to tread upon the same *surface* must be rigidly observed, especially during mild or warm weather. At the same time it has been noticed that if the two classes of cattle are separated, by even a rail fence, the Northern cattle are practically safe, although I think a wider berth to the disease might be profitably given.

My second investigation was at the Eastern Michigan Asylum, of Pontiac. The following extracts from correspondence upon the subject will no doubt show plainly how I proceeded from time to time. On the 10th of September I received the following letter from Dr. Hurd and forwarded it to you:

EASTERN MICHIGAN ASYLUM,
Pontiac, September 9, 1885.

E. A. A. Grange, V. S.:

DEAR SIR:—This asylum has had for a number of years a valuable lot of Berkshire hogs. They have been carefully taken care of, and until within the past week, exceptionally healthy. During thê past few days, however, a disease has developed among them which has been called, by all who have seen them, hog cholera. It does not seem to be, however, cholera at all. The symptoms are these : The hog first appears to be stiff in the hind legs, and clumsy in movement. After a few hours he staggers when he walks and before the day is out the hind legs are powerless. About the same time vomiting and purging takes place and the hog speedily succumbs. Upon P. M. the spleen is found soft and broken down, permitting the finger to be thrust through it at any point; portions of the lungs, especially the lower lobes, are generally found hepatized. No trace of inflammation, congestion, or other trouble is found in the alimentary canal. The disease appears with great violence and attacks the healthiest hogs. We have removed them from the present pens and have scattered them about in a large open field. We have also changed their feed, and separated the sick from the well, as there seems to be a degree of infection in the trouble, but to no purpose. I take the liberty of writing to you to ask whether in your experience anything can be done to arrest the progress of the disease. From present appearances about $2,000 worth of hogs will go. If you can make any suggestion as to the management of these cases I will be under many obligations.

Yours, etc.,
HENRY M. HURD,
Medical Superintendent.

I then received the following:

Kalamazoo, Mich., September 13, 1885.

Prof. E. A. A. Grange, Lansing, Mich.:

DEAR SIR :—Yours of 10th covering Dr. Hurd's of the 9th has just reached me here. You will please proceed at once to Pontiac and thoroughly investigate this outbreak of swine plague, at the Eastern Asylum, provide such temporary quarantine as you may deem necessary, and report personally to the Board here on Tuesday evening next. Will telegraph you to-day, if possible. Cannot now get in office.

Yours truly,
H. H. HINDS,
President Commission.

Lansing, Mich., September 19, 1885.

C. F. Moore, Secretary Live Stock Commission:

DEAR SIR:—In compliance with instructions received from Mr. Hinds, on the 14th inst., I proceeded to the Eastern Asylum at Pontiac, to investigate a disease among the swine of that institution. Arriving there after dark I visited the animals, and upon taking the temperature of several, I found them to be in a very feverish condition, and exhibiting considerable evidence of pulmonary trouble. Owing to the lateness of the hour, I delayed further investigation till day-light, and on renewing it in the morning, I found the animals in various conditions in the field, some lying, others walking about, but progressing, in many instances, with a staggering gait. Having observed the manifestations of the disease when alive, and wishing to hold a *post mortem*, the Medical Superintendent ordered one killed, when I had an opportunity of observing the morbid changes. I may here say that when epizootic disease breaks out among hogs it is generally supposed to be hog cholera, and on this account looked carefully for the usual manifestations of that disease, but from the fact that they were in the main absent, both in the living and dead animals, and further as I could find no source by which the contagion of that disease would probably have been introduced, considerable doubt arose in my mind if this was the real complaint, but was rather inclined to regard it as another form of blood poison. As I was required to report to the State Sanitary Commission that evening at Kalamazoo, my investigation was somewhat hurried. I, however, took the precaution to warn the authorities of the institution that it was probably contagious, and the strictest quarantine was promised me by them.

I have since learned that a number more of the animals have died, amounting to over eighty in all.

I would say in addition that since my return home, I have looked extensively through the somewhat exhaustive government reports upon the subject of hog cholera, and do find some cases which are regarded as it, that bear some resemblance to those I examined, but to determine whether this is the existing disease in the herd, I think, requires further investigation. In conclusion, I may say, that having had occasion to write to the Superintendent of the asylum since my return, I again requested him to observe the strictest quarantine.

E. A. A. GRANGE,
State Veterinarian.

On the 18th September I received the following from Dr. Hurd:

EASTERN MICHIGAN ASYLUM,
Pontiac, Mich., September 17, 1885.

Dr. E. A. A. Grange:

DEAR SIR:— Since you were here post-mortems have been made upon six different hogs. The appearances found resemble very nearly the case examined by yourself. There is enlargement, softening and breaking down of the spleen and more or less hepatization of the lungs. In one instance pus was found in one of the kidneys. In several cases there seemed inflammation in the small intestines. The disease seems unchecked, and I see little possibility of saving the remainder of the hogs.

I write in accordance with your suggestions at the time you left here.

Very truly yours,
HENRY M. HURD,
Medical Superintendent.

Box 351, Lansing, Mich.

And wrote him as follows:

Lansing, Mich., September 18, 1885.

Dr. H. M. Hurd, Pontiac:

DEAR SIR:—In reply to yours of the 17th I beg to say, that owing to the fact that the autopsies, since I was with you, so much resembled the one I held that it would be fair to infer that they are all affected with the same form of blood poison, but to determine the course of it will require further investigation, which I will at once report to the State Live Stock Sanitary Commission. The water I brought with me has been examined under the microscope, but there is no appearance of living organism in it.

I am,
Yours truly,
E. A. A. GRANGE,
State Veterinarian.

On the 19th of September Dr. Hurd wrote me as follows:

EASTERN MICHIGAN ASYLUM,
Pontiac. Mich., September 19, 1885.

Dr. E. A. A. Grange:

DEAR SIR:—Since your visit here our pigs have continued to die, several each day. From the 16th to the 19th inclusive, seventeen have died, all but one of these being last spring's pigs. On all of the seventeen *post mortems* were made, and records kept of the same. I send you a summary of the results of these *post mortems*. Two of these pigs were nearly helpless and were killed, the others died a natural death. One of those killed was watched for some time previous to death, and an attempt was made to secure a record of the temperature. A clinical thermometer was placed in the rectum and held there for ten minutes. It is feared that the register was not correct, for when removed the mercury was found at the top of the tube registering 111°. This pig continued kicking with its hind legs much of the time, occasionally seeming to have convulsive seizures, during which all the legs moved vigorously, and these movements continued for some ten minutes previous to her being killed. She frothed at the mouth, gasped for breath constantly, and the conjunctives were much infected.

Of the seventeen pigs examined, fifteen are noted as presenting much anæmia of the muscular tissues. In one, the tissues were not only anæmic, but dry, and cork-like, and in one the abdominal muscular tissues were remarkably anasarcoused. In these examinations the heart has afforded us nothing of special interest.

The lungs in fifteen cases were more or less hepatized, and as a rule, congested throughout, where hepatization only extended to small portions. In several cases the pleuræ were adherent, and in two they were very much thickened. In the lungs of the two pigs that were killed we found nothing of special interest. There was but little inflammation, and no hepatization present. In one case the pleural cavity contained considerable fluid, and in this case the pleuræ were much thickened. The spleens of fourteen were noted as enlarged and more or less softened. The others were about normal.

Of the kidneys, two were thickly covered with the dark spots which you noticed when here, and several were much congested, while in three cases pus was found, one kidney containing a large quantity. In two cases the kidney presented a peculiar appearance, the substance of the kidney being much destroyed, forming but a shell and a sack within, which was filled with foul smelling urine, and here the bladder was also filled with urine.

As to the intestines, in twelve cases the large intestine was noted as more or less inflamed in portions, and in several the small intestine was also inflamed.

The stomach was found to be inflamed almost without exception,—in some cases very much so, and others but slightly and in portions. The stomach was large, still filled with half-digested matter, which in the majority of cases was soft and rather moist, but in one case was quite dry and hard. The fæcal matter in the intestines was as a rule of a drab or gray color, though in one or two cases the fæces was quite hard and dry. In two cases the mesenteric glands were found to be very much congested.

Several more pigs are affected and will probably die.

We hope that these results of the *post mortems* may be of aid to you in determining what the disease is which is so rapidly depleting our piggery. We shall be glad to hear from you in regard to the matter.

Very truly yours,
HENRY M. HURD,
Medical Superintendent.

Lansing, Mich., September 22, 1885.

Dr. H. M. Hurd, Pontiac:

DEAR SIR:—Yours of the 19th inst. received this A. M., and in reply have to thank you for the very interesting account of the various autopsies. I must say that the enteric complications, alluded to in so many instances, point in a very marked manner to the disease commonly called hog cholera, also the convulsive efforts of some of the animals previous to death are indicative of that disease. I have reported the result of my investigation to the Live Stock Sanitary Commission. Keep the institution quarantined. I am,

Yours very truly,
E. A. A. GRANGE.
State Veterinarian.

As the following letter shows, I was soon instructed to again visit the asylum:

Lansing, Mich., October 6, 1885.

Hon. H. H. Hinds, Stanton, Mich.:

SIR:—As requested by you I proceeded to Pontiac on the 2d of October to continue investigation of the swine plague existing at the Eastern Asylum of that place. I found as the remains of the herd of, say 170, about 30 animals living, and apparently in good health. Among them was one hog which had been attacked by the plague that was on a fair way towards recovery, but it exhibited very plainly the characteristic skin lesions of hog cholera, and on enquiry from the foreman, I learned that about fifty of the animals affected since I first visited the institution, presented these symptoms in a well marked degree. I was also given the tabulated notes of one of Dr. Hurd's assistants, showing the *post mortem* symptoms of 26 animals, and from it am able to recognize common lesions of hog cholera in the majority of instances. These, together with other circumstances, lead me to the conclusion that the enzootic was purely hog cholera and dispelled any previous doubt I had entertained as to the nature of the disease.

Yours respectfully,
E. A. A. GRANGE,
State Veterinarian.

I would like to say, with reference to the above plague, that I think much could be done, in reducing the percentage of deaths by widely circulating detailed descriptions of the disease, and how to treat or prevent it; for experimental work in this direction has given color to the idea, that its ravages may be formidably combatted, with certain remedies, given under favorable circumstances. (See the report of the Commissioner of Agriculture, Washington, D. C., 1881–2, page 350, etc.)

In November, 1885, I was instructed by you to investigate a disease which was attacking certain animals in the vicinity of Albion, Mich.; and on doing so formed the opinion, from innoculation and surrounding circumstances, that it was not of a contagious nature, and therefore did not come within the province of the Live Stock Sanitary Commission to investigate it further. As I have not heard of any more animals being attacked, since quarantine was raised, I have concluded that the cause of the complaint has disappeared. I am inclined to attribute the appearance of the malady to some neurotic poison, obtained in an unknown manner.

In December, 1885, I was requested by Mr. C. F. Moore to examine a cow as to contagious pleuro-pneumonia, but a careful *post mortem* did not reveal any of the symptoms of that disease.

In February, 1886, I went to Sebewa, Ionia county, to investigate a supposed out-break of contagious pleuro-pneumonia, but on examination I diagnosed it a case of tuberculosus, and some time afterwards had the opportunity of examining the organs of respiration, of the same animal, where I found abundant evidence of tubercle, but none of contagious pleuro-pneumonia.

On the 3rd of March, 1886, I visited the farm of Mr. Brockway, Jackson county, it being reported that glanders and farcy existed to an alarming extent among horses, cattle, and sheep, there. The following letter will explain the situation:

Lansing, March 4, 1886.

Hon. H. H. Hinds, Stanton:

SIR:—As requested I proceeded to the farm of Mr. Brockway, Jackson county, yesterday, and examined nine head of horses, seventeen head of cattle, about twenty sheep and a number of hogs, with the following results: Among the horses I found two discharging from the nostrils and showing other symptoms of "glanders," another one had "farcy" but the fourth one had only a swelling upon the abdomen, which may, however, develop into "glanders" or "farcy" in the future. The remaining ones, which were in a shed some distance from those affected, did not exhibit any symptoms of the disease. I held a *post mortem* upon the mare, which was said to have brought the disease to the farm. and found some evidence of "glanders" in the lungs.

Among the cattle I was shown one calf which was said to be glandered. This I found with a sore on each side of its nose, but no other suspicious symptoms of the disease. Not being satisfied with this examination, I had the animal destroyed, but a careful *post mortem* did not reveal any symptoms whatever of glanders. I may here add, that this calf has been subjected during the past winter to the coldest of weather, day after day, the result being that both its ears and one leg were frozen, and probably many other parts of the body. I am now of the opinion that the sore nose was the result of frost bite, and the general debility of the animal to undue exposure. I could not find any symptoms of glanders among the other cattle, after a thorough examination.

I then proceeded to the sheep, but did not discover any that exhibited the external manifestation of glanders, although all were much debilitated.

I next examined the hogs, but they appeared to be in a healthy condition.

As none of the animals affected come within the jurisdiction of the Live Stock Sanitary Commission I did not quarantine the farm; but advised destruction of the remaining horses affected.

Yours obediently,
E. A. A. GRANGE,
State Veterinarian.

During the spring of 1886 I had brought under my notice, first as a private practitioner and later as State Veterinarian, a disease among cattle which was of a very malignant nature. I take the liberty of re-producing a letter I addressed to the editor of the *Agricultural College Speculum* by way of describing it:

AGRICULTURAL COLLEGE, MICH.,
June 12, 1886.

To the Editor of the Speculum:

SIR:—During the latter part of last February I was called upon by a prominent breeder in Shiawassee county, of this State, to examine an ox which was suffering from a disease which had previously carried off some other animals upon the same farm, and which was an unknown complaint in the district referred to.

Upon my arrival at the farm I found the animal already dead, but after getting a history of this case, and the others, I at once felt that I had a very peculiar disease to deal with; however, after making a *post mortem* I coucluded that it was a malignant form of catarrhal fever, and indeed the resemblance to that disease, as described by many writers, was most striking, although some of the symptoms differ from it. Another disease which it closely resembled, is Russian cattle plague, or Rinderpest, at the same time many of the characteristic features of *bovine mucitis* (the name which I give to the disease in question), are very different from that dreadful plague. In order that the readers of the Speculum may recognize the disorder should it visit their locality, an outline of the leading symptoms of it may be interesting.

The first thing generally noticed is a stiffness of the voluntary muscles, the animal moving with considerable reluctance, or it may be lame; this is accompanied with, or closely followed by rise of temperature, say to 107° Fahrenheit, the pulse becomes rapid, about 100° per minute, breathing accelerated and often accompanied with a moan or grunt. The eyes become glassy or opaque, and tears are discharged profusely from them. In the course of 24 hours these symptoms become aggravated, the nostrils have a discharge from them, and their lining membrane is much inflamed. Sometimes the skin of the muzzle, and even lower lip will appear sore, or ulcerated, the lining of the mouth will also become abraded, and froth or saliva may emanate from it in variable quantity.

The condition of the bowels varies, sometimes the fæces will be frequent, fluid, and fœtid; at others they are not much affected. The urine also varies; at times it is highly colored with blood; at others it will be almost natural.

The appetite is lost soon after the first symptoms manifest themselves, and rumination is suspended. In about three or four days, if the creature does not get relief, death usually closes the scene during a paroxyism of convulsions.

In the early part of the present month, I was called upon to investigate this disease officially, as State Veterinarian; I had a very good opportunity to watch its progress in one animal, and may say that the onset, course, and termination, resembled the others which had been previously attacked, in almost every particular. Further, I have now had an opportunity of holding a *post mortem* in two instances, one last February and one last week, and have to say that they both presented, substantially, the same characteristic lesions, *which were inflammation of the various mucous membranes throughout the entire animal economy.* As to the cause of this complaint, I must admit that it is wrapped in the greatest obscurity, but look upon the disease as a zymotic fever, due to the presence of a *ferment*, the nature and source of which will require further investigation.

With regard to the treatment, I may say it has been most unsatisfactory up to the present, but after the general comfort of the animal has been attended to, would recommend those remedies which are calculated to destroy the germs of such disorders, such as Chinchona or its alkaloids. I think to be of any avail, though, they must be given in the very earliest stage of the disease; I may say further, that the limited number of cases which have as yet been brought under my notice, have not given me very extensive opportunities for experimenting with the remedies used in such maladies. Trusting that I may be able to speak more encouragingly in the near future as to the cure of the complaint,

I am, sir,
Yours respectfully,
E. A. A. GRANGE, *V. S.*

In December, 1886, I visited the city of Chicago for the purpose of examining cattle that had been exposed to pleuro-pneumonia, and had an opportunity of seeing autopsies in one hundred and forty-three cases. Of these forty-two were affected with the disease in one stage or another.

There has been considerable difference of opinion amongst veterinarians from time to time as to danger to be apprehended from apparently recovered cases; but I was convinced from what I saw there, that perhaps the most danger is from those cases which to all intents and purposes have outlived the dreaded disorder.

I saw a *post mortem* in one case whose history showed the danger to be apprehended from apparently recovered cases in such a marked degree that I repeat it here. The cow's owner informed me that last July, the cow in question, was taken with what he thought to be an ordinary cold, but as she did not seem to recover from it in the usual time, he consulted some of his neighbors, and they suggested that she might have pleuro-pneumonia, and after some hesitation he concluded to consign her to the grave; but on the day he had set apart for her destruction she appeared to be somewhat better, so much so, that he determined to allow her to live a little longer, and from that day onward she continued to improve, until he thought she was perfectly well, when she increased in weight from time to time, and was brought to the slaughter-house, as soon as she was thought fat enough to be killed, with some of his other cattle. A *post mortem* was made in due course, and the disease was plainly exhibited by the presence of a cyst, containing, say a pint of pulpy substance, in one of her lungs. The probability is, if she had been allowed to live, and subsequently exposed to cold or other exciting cause, the disease would have again burst forth, in a virulent form, perhaps after she had been shipped to some other part of the country, for she might easily have been sold for a sound cow.

In connection with contagious pleuro-pneumonia I wish to say a word or two concerning the dissemmination of the virus and the observance of quarantine regulations.

In the first place, those who have had unlimited experience with this disease tell us that it is not only spread from one animal to another, but that attendants may convey the contagious matter of the disease in their clothes, upon their boots, or the skin of their hands, or it may be conveyed by other species of animals, such as dogs, for instance, that have been in contact with diseased cattle, besides; rail cars, or boats which have conveyed diseased cattle, are liable to spread the contagion; so if the disease is so easily spread, it is obvious that the quarantine regulations should be of the strictest nature, and none but immediate attendants should be allowed access to the diseased cattle, and even *they* should be required to thoroughly disinfect *themselves* and change their clothes on going to, or from the infected buildings.

I may add that I do not think such precautions have been sufficiently observed during some of the recent outbreaks in the West.

GLANDERS.

Although this disease does not come within the jurisdiction of the Live Stock Sanitary commission, as far as horses are concerned, yet I think it proper to report, that I have made a number of investigations concerning it, in different parts of the State. I have condemned in all about twenty animals, after a personal inspection, and have received numerous letters from all quarters in the State relative to it, showing clearly that it does exist, I might almost say to an alarming extent, so much so, that I think it would give general satisfaction were it included among the diseases over which the Live Stock Commission have jurisdiction.

I cannot close this brief report without expressing a feeling of gratitude for the pleasant and courteous consideration I have always met with from the members of the Live Stock Commission during our various transactions.

I am, sir, yours respectfully,

E. A. A. GRANGE,
State Veterinarian.

APPENDIX.

◆

EXHIBIT A.

REPORT OF SPECIAL AGENT GIBBONS ON TEXAS FEVER AT DETROIT.

Hon. H. H. Hinds, President Live Stock Sanitary Commission, Stanton, Michigan:

DEAR SIR—I herewith submit to the members of your Commission, a detailed report of my work as agent of the Commission at Detroit.

On my appointment as agent June 25th, 1886, I called together all the butchers who are handling Texas Cattle, and read to them the law passed at the last session of the Legislature, in reference to the handling of these cattle in Michigan. We then agreed on a series of streets over which these cattle were to be driven from the stock yards, and in each instance the most direct routes to the slaughter houses were selected.

The President of the Commission was notified of the routes selected, and he prepared a poster, setting forth the streets over which the Texas cattle were to be driven, and warning parties owning native cattle to keep them off the streets designated. Posters were printed and posted along all these streets and at the stock yards. Circulars containing the same matter were also printed and sent by mail to the milkmen, so far as their names could be ascertained. Notices covering the same matter were also published in all the city papers—both English and German. A portion of each of the stock yards was set apart for receiving Texas cattle, and separate scales erected for weighing them. These yards were entirely separated from those used for yarding native cattle, and on each was posted a card "For the Yarding of Texas Cattle only."

The butchers showed a comendable spirit in complying with the law, and so far as they are concerned, it has been carried out fully. In previous years they had been in the habit of getting a supply of cattle sufficient for a week at one shipment and putting them to pasture, to be used as required. This season they have had the cattle shipped to them in such numbers as they could handle daily, and none have been sent to pasture. As a man has to accompany every shipment, it has added quite an item to the cost of the cattle, but there has been no complaint.

On September 10th I received information that Texas fever had broken out among the cattle in the township of Springwells, near the Michigan Central stock yards, and found four cases, all of which proved fatal. The facts in these cases I found upon investigation to be as follows:

Mr. Warren, who lives on Livernois Avenue, is employed as night watchman at the Michigan Central car shops. The company have several acres of land fenced in which affords good pasturage. Mr. Warren was in the habit of driving two of his cows each night to pasture on these grounds. To reach them he had to pass over a portion of the route set apart for the driving of Texas cattle. These two cows died, having all the symptoms of Texas fever.

Mr. Tillotson, residing on Washtenaw Avenue, lost one cow with what was supposed to be Texas fever. This animal had been exposed, having been pastured on Dix Road which had been set apart for driving Texas cattle.

The other case was that of a cow owned by a Polander residing on Military Avenue. There was none of the family who could speak English, so that nothing definite could be learned of this case, but as they are living in close proximity to the Dix Road, and the pasture being good along this road, it is safe to say that the animal had been exposed.

These are the only cases that have occurred this season, so far as I am aware of, and when compared with the losses of other seasons, shows that the present law has proved very beneficial.

The receipts of Texas cattle have been lighter this season than usual, our own State having furnished a larger supply for this market than heretofore.

In former years Texas cattle commenced to run about the first of April, but this year it was near the end of May before our butchers commenced to draw on the West for their supply.

The receipts of Western cattle at this point for the several months I have acted as agent, were as follows: July, 1,176 head; August, 3,428 head; September, 4,584 head; October, 3,961 head.

Very respectfully yours,

BEN. GIBBONS,
Agent.

Detroit, November 1st, 1886.

DETROIT, *August 1, 1886.*

H. H. HINDS, ESQ., *Stanton, Mich.:*

DEAR SIR: I herewith submit to you a report of the number of cattle received in this city for the month of July, which come under the provisions of act 182, session laws 1885.

MICHIGAN CENTRAL YARDS.

Date.	No.
July 1, 1886	102
" 3, 1886	119
" 4, 1886	115
" 11, 1886	27
" 14, 1886	49
" 15, 1886	25
" 16, 1886	120
" 18, 1886	24
" 19, 1886	27
" 21, 1886	51
" 22, 1886	55
" 25, 1886	26
" 28, 1886	111
" 30, 1886	109
	960

KING'S YARDS.

Date.	No.
July 24, 1886	45
" 28, 1886	52
Total	97

WEBB BROTHERS.

Date.	No.
July 24, 1886	61
" 31, 1886	58
Total	119

This firm have a side track to their slaughter house and do not put their cattle in the yards. The cattle are billed to the yards and appear among the receipts.

RECAPITULATION.

Michigan Central yards	960
King's yards	97
Webb Bros. slaughter house	119
Total	1,176

Very respectfully yours,
BEN. GIBBONS.

DETROIT, *September 1, 1886.*

H. H. Hinds, Esq., Stanton, Mich. :

Herewith I submit a detailed report of the number and destination of Western cattle received at the Detroit stock yards during the month of August, 1886:

MICHIGAN CENTRAL YARDS.

Date.	No. Head.
August 1, local	26
" 6, "	187
" 8, "	76
" 13, "	237
" 15, "	28
" 18, "	25
" 19, "	76
" 20, through	145
" 20, local	209
" 21, through	287
" 22, local	26
" 25, "	25
" 26, "	60
" 27, through	389
" 27, local	189
" 28, through	707
" 28, local	26
" 29, "	26
Total	2,684

KING'S YARDS.

Date.	No. Head.
August 3	76
" 10	84
" 18	45
" 24	105
" 28	100
Total	410

WEBB'S SLAUGHTER HOUSE.

August 3	30
" 10	31
" 18	46
" 28	47
Total	154

RECAPITULATION.

	No. Head.
Michigan Central yards	2,684
King's yards	410
Webb's slaughter house	154
Total	3,248

Very respectfully yours,

BEN. GIBBONS, *Agent.*

DETROIT, *Oct. 1, 1886.*

Hon. H. H. Hinds, President Live Stock Sanitary Commission, Stanton, Mich.:

Herewith find report of receipts of western cattle at this point for the month of September, 1886.

MICHIGAN CENTRAL YARDS—FOR LOCAL CONSUMPTION.

Date.	No. of loads.	No. of cattle.
September 1	4	107
" 3	6	160
" 8	4	104
" 9	14	331
" 11	3	81
" 15	2	50
" 16	5	131
" 19	2	50
" 20	2	54
" 22	2	50
" 23	2	53
" 25	3	81
" 27	2	55
" 30	3	75
Total	54	1,382

MICHIGAN CENTRAL YARDS—THROUGH STOCK FED AND WATERED.

Date.	No. of loads.	No. of cattle.
September 3	15	291
" 10	12	269
" 11	14	288
" 13	12	203
" 18	9	204
" 25	7	147
" 30	13	278
Total	82	1,680

WEBB BROS. SLAUGHTER HOUSE—FOR LOCAL CONSUMPTION.

Date.	No. of loads.	No. of cattle.
September 2	2	56
" 9	4	114
" 16	2	55
" 23	3	84
" 30	3	81
Total	14	390

KING'S YARDS—FOR LOCAL CONSUMPTION.

Date.	No. of loads.	No. of cattle.
September 2	7	196
“ 9	9	203
“ 16	7	189
“ 23	13	338
“ 30	9	206
Total	45	1,132

RECAPITULATION.

Michigan Central yards	3,062
King's yards	1,132
Webb's slaughter house	390
Total	4,584

BEN. GIBBONS, *Agent.*

DETROIT, *November 1, 1886.*

H. H. Hinds, Esq., Stanton, Mich.:

Herewith I submit a detailed report of the number and destination of western cattle received at the Detroit stock yards during the month of October, 1886:

MICHIGAN CENTRAL YARDS.

Date.	No. Head.
October 1, local	154
“ 2, “	132
“ 2, through	187
“ 7, “	316
“ 7, local	51
“ 8, “	25
“ 9, “	76
“ 9, through	187
“ 13, local	42
“ 14, “	26
“ 15, “	124
“ 15, through	166
“ 16, local	48
“ 17, “	24
“ 20, “	79
“ 22, “	154
“ 23, through	246
“ 23, local	52
“ 27, “	75
“ 29, “	153
“ 30, “	106
“ 31, “	25
Total	2,448

KING'S YARDS.

Date.	No. Head.
October 2	236
“ 9	228
“ 16	254
“ 23	224
“ 30	289
Total	1,231

WEBB BROTHERS' SLAUGHTER HOUSE.

October 2	57
" 9	54
" 16	58
" 23	56
" 30	57
Total	282

RECAPITULATION.

Michigan Central yards	2,448
King's yards	1,231
Webb Brothers' slaughter house	282
Total	3,961

Very respectfully yours,

BEN. GIBBONS, *Agent.*

SECOND BIENNIAL REPORT

OF THE

LIVE STOCK SANITARY COMMISSION

FROM

MARCH 1, 1887, TO DECEMBER 31, 1888.

BY AUTHORITY.

LANSING:
DARIUS D. THORP, STATE PRINTER AND BINDER.
1889.

STATE LIVE STOCK SANITARY COMMISSION.

MEMBERS OF THE COMMISSION.

H. H. HINDS, President,	STANTON.
C. F. MOORE, Secretary,	ST. CLAIR.
J. J. WOODMAN,	PAW PAW.

STATE VETERINARIAN.

PROF. E. A. A. GRANGE,
State Agricultural College,
Lansing, Michigan.

REPORT OF THE STATE LÍVE STOOK SANITARY COMMISSION.

To the Governor of Michigan:

SIR—Act 182, Session Laws of 1885, under which the State Live Stock Sanitary Commission derives the authority for its existence, provides, in section 21: "The commission shall make biennally a detailed report of its doings to the Governor, which report shall be transmitted to the Legislature at its regular biennial session."

A literal compliance with this provision of law, in this instance, would make a pamphlet of such voluminous proportions as to make it wearisome for the Governor and members of the Legislature to undertake to follow the details through. The commission, therefore, submit the following as a general report of the results of their acts for the years 1887 and 1888, omitting details which, in a general way, would be uninteresting.

We also make some suggestions which may be of some interest to the public.

At the date of the close of our last biennial report, covering the years 1885 and 1886, cantagious pleuro-pneumonia, that most destructive of all cattle diseases, had been found to exist in Cook county, Ill., among thousands of cattle in and about Chicago, and it had been found necessary, in protecting our great cattle industries, to establish a strict quarantine prohibiting the importation of any neat cattle to this State from said Cook county for any purpose whatever. The following paragraph is taken from that report, same having been written just as the report went to press in February, two years ago. "The situation at Chicago, so far as the cattle industry of the country in general and this State in particular are concerned, shows no improvement. A few thousand cattle have been slaughtered in distilleries and elsewhere but thousands of diseased and exposed cattle are still scattered in various parts of the city, and there seems to be no well founded hope that the disease will be stamped out at Chicago for a long time to come. The desire of the cattle growers of the State, that was concurred in by the Governor and Legislature, that Congress would, at its present session, pass the so-called 'Miller bill,' the immediate purposes of which is to set on foot proper national machinery to stamp out contagious pleuro-pneumonia in the United States seems unlikely to be realized, in which event it seems to be an inevitable necessity that foi the next two years at least we shall be compelled to try and protect our great and constantly growing cattle industries by a rigid maintenance of quarantine regulations against all infected localities. Should an outbreak of this exotic animal disease, for the existence of which in this country Michigan nor none of its citizens are in any way responsible, occur in this

State, it will undoubtedly be the best and only safe policy to strike an imaginary line around the diseased center sufficiently comprehensive to include all the diseased and exposed cattle, and kill all within the line without hope of assistance from national authority."

The prophesy therein recorded, relating to the fate of the "Miller bill," was realized, but fortunately for the cattle industries of the country in general, and this State in particular, in an omnibus appropriation bill passed during the very last hour of the life of the 49th Congress, an item of half a million of dollars was inserted for the use of the Bureau of Animal Industry to be used in stamping out contageous plureo-pneumonia in this country. The first session of the 50th Congress duplicated the same appropriation. The Bureau of Animal Industry acted promptly and the work is still proceeding on the Atlantic sea-board, the disease having been already effectually stamped out in the interior and in the west.

Immediately on the action of Congress, first above referred to, the Bureau of Animal Industry organized for the serious work on hand at Chicago. Prof. James Law, of Cornell University, was placed in charge of the work in co-operation with the efficient Illinois Live Stock Sanitary Commission. An ample corps of assistants were retained, together with a full complement of other employés and police, to see that all regulations were properly observed. The policy of peremptory slaughter of all diseased and exposed animals was undertaken. The pole ax and butchers knife were used without mercy, and the policy thus pursued was attended with speedy and perfect success. A very large share of the credit for this result is due the Illinois Commission. This required a large outlay of money but was much the cheapest and the only safe policy to pursue. Contagious plureo-pneumonia was stamped out. in and about Chicago. The last acute case was destroyed on July 28th, 1887. The great menace to the cattle industries of the west from this dread disease was thereby removed.

It was deemed best by this Commission to maintain our efficient quarantine regulations for a sufficient period to guarantee safety, and with some modifications on October 25, 1887, the regulations were maintained until May 8, 1888. when they were removed.

Some supposed cases of contagious pleuro-pneumonia have been reported by local authorities in this State, but this Commission is warranted in stating that there never was a case within the borders of this State.

The disease that is and will probably permanently continue to be a menance to Michigan cattle interests is Texas or splenic fever. A continual stream of these contagion carrying cattle are constantly passing over our Trunk line railroads from their native breeding pastures in the southwest to the meat consuming markets of the east. Not only is contact with these so-called Texas cattle, during all the months of the year when we do not have heavy frosts, fatal to our native cattle, but all the cars, yards and pens in which these are handled, and the streets and commons over which they may be driven, become infected with the germs of the disease, and nothing seems to avert the danger until a hard frost comes in the fall when all danger for that season ceases. By the provision of law, Act 198, Laws of 1885, as amended by Act 57, Law of 1887, it is contemplated that all cars that carry any of this class of cattle, as well as all stockyards in which same are handled shall be branded "For the transportation (or yarding) of Texas cattle only," and that no native cattle shall be admitted to these cars or yards between the

1st day of April and the 1st day of November of each year. This provision of law, so far as it applies to railroads in branding cars has never yet been complied with in the slightest particular. As was noted in our last report this Commission for the year 1886 adopted certain rules and regulations prescribing certain streets only on which these southern cattle should be driven in the city of Detroit, in transit from the stockyards without the city to the various slaughter houses that are located promiscuously within the city, and appointed an agent to see that the regulations were observed. As noted in that report the result of that action at Detroit was to reduce the loss of milch cows in that city from this disease, amounting to thousands of dollars annually to practically nothing. This experiment was so eminently satisfactory at Detroit that the same policy was pursued at that point for the year 1887 with like satisfactory results. This action at Detroit, however, afforded no sort of protection to any other point in the State, and outbreaks occurred at Adrian, Grand Rapids, and elsewhere, causing large cash losses, and very seriously deranging the business of milkmen, string butchers and others. Thus matters stood at the opening of the season of 1888 when the Commission decided to apply the heroic treatment of prohibition to all traffic in this class of cattle in this State for the past season. This plan was considered by this Commission not only possible of execution, but entirely practicable, although arrived at after consultation with the Governor, the Railroad Commissioner, the managers of leading railroads, stock growers, butchers, farmers and other interested parties, a majority of whom were opposed to the plan. The Commission therefore, on May 8, adopted prohibitory rules and regulations as above stated, and on May 12 the Governor issued his proclamation publishing same, which is as follows:

MICHIGAN.

PROCLAMATION PROHIBITING THE IMPORTATION OF NEAT CATTLE FROM SOUTH OF THE THIRTY-SIXTH PARALLEL, NORTH LATITUDE, 1888.

PROCLAMATION.

WHEREAS, a clause of Act 182, Session Laws of 1885 declares in substance and language, that whenever the Governor of the State shall have good reason to believe that any dangerous, contagious or infectious disease has become epizoötic in certain localities in other States, territories or countries, or that there are conditions which render such domestic animals from such infected districts liable to convey such disease, he shall, by proclamation, prohibit the importation of any live stock of the kind diseased, into the State, etc.; and

WHEREAS, It is clearly understood that cattle coming from the southern portion of the United States are affected with a contagious disease, known as Texas or splenic fever, which is very fatal to our northern cattle, and which annually, for years past, has caused serious loss among the cattle stock of this State, and

WHEREAS, The State Live Stock Sanitary Commission did on May 8 adopt the following quarantine regulations regarding the importation of so-called Texas cattle, with the view of the absolute prohibitation of their admission to this State previous to the 1st day of November next, viz.:

"RULES AND REGULATIONS OF THE MICHIGAN LIVE STOCK SANITARY COMMISSION RELATING TO THE IMPORTATION OF SO-CALLED TEXAS CATTLE.

WHEREAS, by Sec. 4, Act 182, Session Laws of 1885, it is made the duty of the State Live Stock Sanitary Commission to protect the health of the domestic animals of the State from all contagious or infectious diseases of a malignant character, and for this purpose it is hereby authorized and empowered to establish, maintain and enforce such quarantine, sanitary and other regulations as it may deem necessary, and

WHEREAS, The bringing to this State for slaughter or other purposes so-called Texas cattle, or cattle raised south of the thirty-sixth parallel of north latitude, and that have not subsequently been kept continuously at least one winter north of said parallel, and which may be brought within the limits of this State between the first day of April and the first day of November following, very seriously endangers the health of our cattle stock; and

WHEREAS, As a matter of fact so-called Texas or splenic fever so fatal to our northern cattle is only contracted from contact with these cattle or in the recent environments of the same;

Now therefore, It is hereby ordered and directed by the Live Stock Sanitary Commission of the State of Michigan, in accordance with the Act heretofore referred to, that hereafter and until the first day of November next no cattle coming from south of the thirty-sixth parallel of north latitude, and that have not wintered north of the said thirty-sixth parallel, shall be brought to any place in this State for the purpose of slaughter, or for any other purpose except such cattle be in transit across this State, and these through cattle shall not be unloaded for feeding or other purposes in this State, except in yards designated and branded for the feeding of Texas cattle only.

In order that no expense and practically no inconvenience may be caused to any parties desiring to ship any cattle to this State for slaughter or for other purposes, that are not prescribed by these quarantine regulations, coming from the two points from which the cattle of commerce are principally shipped to this State, viz.: The Union Stock Yards at Chicago and the Stock Yards at East St. Louis, this Commission will, on May 21 next, establish an agency in the vicinity of each of the above named stock yards, at which all parties must apply who desire to ship cattle to this State from these points, and upon presenting the proper evidence at the agency, showing that the proposed shipment of cattle are not prohibited from coming to this State by the above order a certificate permitting the shipment to any part of this State will be issued to the shipper without cost to him.

Now therefore, I, Cyrus G. Luce, Governor of the State of Michigan, by virtue of the authority vested in me by law, issue this, my proclamation, and it is hereby ordered that from and after the 21st day of May, and until the first day of November next, the importation of all neat cattle to this State from south of the thirty-sixth parallel of north latitude, and that have not wintered north of said thirty-sixth parallel, is hereby prohibited and forbidden, except such cattle as are in transit across this State, and they shall only be unloaded in this State for the purpose of feeding and watering, and then only in yards branded and lettered for the "Feeding of Texas Cattle only." And I hereby call the attention of all shippers of live stock, transportation companies and all other parties interested to the manifestly fair and proper rules and regulations of the State Live Stock Sanitary Commission heretofore recited, relating to the subject and to the laws under which the same are made and promulgated.

Done at Lansing, Michigan, this 12th day of May, A. D. 1888.
BY THE GOVERNOR. CYRUS G. LUCE.

F. B. EAGAN,
Deputy Secretary of State.

The carrying out of this plan was attended with considerable expense. L. K. Woodman of Paw Paw was appointed agent at St. Louis, and W. S. Walker, of Utica, at Chicago. The results may be summed up in a statement covering a single line, and that is that not a single case of Texas or splenic fever was reported in Michigan for the year 1888. There was shipped to Michigan between the 21st day of May and the 1st day of November, from Chicago, 374 cars carrying 8,662 head of cattle, and from St. Louis 318 cars carrying 8,375 head of cattle. A total of 692 cars, carrying 17,037 head of cattle.

Various theories have obtained among different parties, all having extensive opportunities of observation and keen perceptions in reasoning from cause to effect, in accounting for the particular manner in which the contagion of Texas Fever is communicated to our northern or native cattle. For instance, some gentlemen who have had large opportunities for observing the characteristics and contagiousness of this disease believed that native cattle might be handled with impunity in cars and pens recently occupied by the Texan—in fact that the native might actually be handled with the Texan so long as they were handled on dry feed, but as soon as the element of green vegetation was introduced and the native feed on the grass that grew up through the excrement and filth left in the track of the Texan, then and not till then was the native in danger. On the other hand our observations with the disease in this State had convinced us that the recent environments of the Texan, whether car, yard, street crossing, or pasture lot, were all susceptible vehicles for conveying the disease germs, and should be avoided and proscribed for the native. With these widely divergent theories as to the proper manner of dealing with these Texans, among the different State authorities, to prevent the annual large losses that is occurring among the native cattle of the northern States from Texas fever, it was thought best by the superintendent of the Union Stock Yards at Chicago to call a meeting early the past season of representatives of the northern States most interested, to confer upon the subject of instituting a series of experiments to determine some of these questions. The conference was held and this commission was represented. A series of experiments were undertaken and were carried on during the past season at the Chicago Stock Yards, and resulted, so far as the tests were concerned, in confirming the judgments we had formed in observing the spread and development of the malady in this State. It is perhaps proper to here note that the National Cattle Growers' Association, at their annual meeting in Chicago in November last, instructed their executive committee to ask Congress to enact national laws relative to handling these Southern cattle similar to our State laws, and also advised the Legislatures of other Northern States to enact similar laws.

The Governor and the Commission have been repeatedly importuned, during the past season, by butchers and butchers associations in different parts of the State, to so modify our prohibitory regulations regarding Texas cattle as to admit these animals to the State for immediate slaughter, provided they were discharged from the cars at the gates of the slaughter houses. These gentlemen have very truthfully stated that thousands of carcases of these same proscribed cattle are annually imported to our State and sold to our people in the shape of dressed beef. They desired to buy the same class of cattle on foot to meet this competition. The Commission have, however, been constrained to adhere to their prohibitory regulations as originally adopted, believing that the only certain way of protecting our native cattle from this malady. Our cattle have been protected for the last year as already stated. Of course it will be readily understood that this Commission has no jurisdiction over the question of what kind of dressed meat shall be sold to our people, whether unwholesome or not. The Commission were agreed upon one thing, and that was, that the annual losses from Texas or splenic fever amounted to thousands of dollars in each of several northern States, the aggregate forming a vast sum entirely out of all proportion to the profit accruing to all parties engaged in an unlimited or unregulated traffic in these Southern cattle, and that an intelligent consideration of this subject ought to afford an opportunity to devise means of handling this traffic with comparatively little danger to our vast Northern cattle industries. Hence the action taken and results reached.

During the past year very serious criticisms have been made by health authorities and newspaper articles on the action or non-action of this Commission relative to the sale of lump-jawed cattle at Detroit. The facts are that there has never yet been reported to this Commission the existence of any particular animal or animals effected with lump-jaw at Detroit or elsewhere in this State, whereby the Commission might take action relative to their destruction. The statement that a Detroit meat inspector "had seen this class of cattle killed and sold in Detroit, and a carcass and two hides shipped to Mt. Clemens," does not form a desirable basis to found a case for damages to the State under our Live Stock Sanitary laws. The fact that the animals were dead and the carcasses removed from the environments of other cattle would accomplish the intentions of our Live Stock Sanitary laws. to protect our domestic animals from this infectious desease. The law under which this Commission is acting does not contemplate that the Commission shall say what meat is wholesome for man to eat nor what should be condemned. The health authorities are charged with that duty.

So called "lump jaw," scientifically named *Actinomycosis*, is a cancerous development of one of the several scorbutic or scrofulous diseases that annually carries off large numbers of our cattle, and is undoubtedly hereditary and probably mildly infectious. The fair presumption, however, is that not a dozen cases of lump jaw exists in the State to-day.

A far more serious development of one of the scrofulous diseases above referred to is tuberculosis. Undoubtedly this disease has gained a serious foothold in our State, and is causing large losses among our cattle stock. It is beyond question both infectious and contagious, particularly in the pulmonary development or consumption of the lungs. The commonly accepted theory is that it is communicable to man, not only by direct contact but also in the partaking of the milk and meat of these diseased animals. This Commission has not as yet been called upon to act in any of these cases, but when the question arises it will engage their very serious attention.

It gives us satisfaction to be able to state that some of the national experiment stations have already entered upon the work of investigation of this plague, and we hope to derive valuable knowledge from these investigations.

Section 22 of Act 182, Laws of 1885, exempted sheep and horses from the operations of our live stock sanitary laws, and therefore contagious and infectious diseases of these domestic animals did not come within the jurisdiction of this Commission up to date of our last report, Act 47, Laws of 1887, placed both sheep and horses under the operation of these sanitary laws.

Contagious diseases of sheep have thus far claimed but little of the Commission's attention. Some cases of what appeared to be contagious opthalmia have been reported and disposed of. Recently cases of scab or mange have been presented for the consideration of the Commission, and the causes and prevention of this contagious parasitical disease of sheep is now under consideration with the commission. In some of the semi-tropical sheep-growing countries seab is among the most serious menaces to the wool-growing industries, but fortunately the climate of our State does not seem favorable to the spread and development of this disease, and therefore it has not appeared a serious obstacle to the success of our flock masters.

As may be readily anticipated the principal contagious disease affecting horses reported to and claiming the attention of the Commission is glanders and its companion disease, with a different development, farcy. Glanders is a loathsome, terrible infectious, and practically incurable disease, to which not only the horse and several other of the lower animals are susceptible, but even man himself.

Experiments and observations in this country and Europe, covering scores of years, have substantially determined that cattle are not susceptible to glanders. The horse and mule seem to afford the only avenue through which this pestilence is spread in this State. Since this part of the law has become operative scarcely a week passes without outbreaks of this disease being reported from various points in the State, and from the wide diversity of territory from which these diseased animals are reported, it becomes entirely apparent that during the past years, when only the Public Health Laws could be applied to wiping out this malady, it steadily made head against the law. Under the present law the remedy of the rifle or bleeding phlegm seems to be entirely effectual.

It may be stated as a fact that the members of this commission have devoted more hours of time to dealing with this particular disease among horses than they have to all the other diseases affecting our domestic animals, and that too, notwithstanding the fact that horses and their diseases have only been under the jurisdiction of this Commission for a period of less than two years. This Commission has condemned and destroyed horses pronounced affected with glanders by the State Veterinarian in the counties of Alcona, Branch, Crawford, Calhoun, Chippewa, Cass, Delta, Gogebec, Huron, Hillsdale, Ingham, Ionia, Jackson, Mecosta, Mason, Montcalm, Monroe, Muskegon, Macomb, Otsego, Sanilac, and St. Clair. In some of these counties glanders were found in several different townships. Cases were also reported from Berrien, Luce, Lenawee, Roscommon, and St. Joseph counties, as well as several reported cases in the counties first named, which, upon investigation, did not prove to be glanders.

The law under which we operate directs that "whenever the Commission shall direct the killing of any domestic animal or animals it shall be the duty of the commissioners to appraise the animal or animals condemned, and in fixing the value thereof the commissioners shall be governed by the value of said animal or animals at the date of appraisement."

The Commission, as at present constituted, believe that a horse having glanders clearly developed has no market or selling value, is in fact worthless, and of all the horses we have thus far ordered destroyed, with four exceptions, we have awarded the nominal damage of one dollar for each case. The disposing of one of these diseased brutes is a more serious and expensive undertaking as the animal frequently has to be taken some distance from a city or village for proper burial. The ground is at times frozen deeply, the snow may be deep, or privilege of entry to woods places for burial, may be denied by the owner. These items combined, however, amount to but a small percentage of the cost to the State, thus far, in dealing with this vile disease. The great items of expense are the traveling expenses and per diem of members of the Board and State Veternarian in reaching these cases, scattered as they are, in various parts of the State.

The Commission are unable, after giving the subject careful thought, to suggest a cheaper and at the same time safe and effectual plan of dealing with this disease. If the law was changed and authority placed in the hands of local officials it is very questionable if the State would save financially, and besides the local officials might not readily detect the disease from lack of experience in observing its characteristics. Their appraisement of values would probably cover a rather wide range, usually about the price of good sound horses, as is indicated by correspondence reaching the Commission, reporting cases where probable value is stated. In fact a local board of health in a recent case reported from a distant county undertook to act for this Commission, of course without authority of law or of the Commission, and determined that an aged mule had glanders and therefore ordered its destruction and appraised and fixed its value at the sum of $135.

The statutes of some states provide and declare that a horse having glanders or farcy shall be peremptorily slaughtered without any compensation whatever. On the other hand the practice of the sanitary authorities in some states is in the line of allowing full value of animals on the basis of health, and then destroying all exposed as well as all the affected horses. The motive that leads to the adoption of this policy is founded on the theory that the plan will induce all parties having any suspicious cases to bring them forward and report them at once. This plan is of course very expensive, and tends to induce irresponsible parties to import to the State diseased and glandered horses with a view of making the State itself furnish a profitable market for these diseased brutes. Our policy has been, as before indicated, to thoroughly investigate all reported cases, and destroy only those pronounced by competent authority as already affected, while in the case of exposed animals we have held them under close watch and surveillance for a reasonable time for the disease germs to incubate. Our observations have led us to the conviction that the disease is only infectious, and that a considerable number of exposed animals are not susceptible, and that being only infectious if a diseased animal were driven along the highway, if not watered at a public trough, or not hitched where healthy animals were subsequently tied, the disease might not be spread.

The disease under our plans of dealing with it seems to be losing ground, and we feel confident that in a large per cent of the localities that we have found it, we have been able to effectually stamp it out.

Jonathan J. Woodman of Paw Paw, Van Buren county, was appointed by the Governor and confirmed by the Senate as a member of this Commission for six years, from the second Tuesday of July, 1887, to succeed Thos. Foster of Flint, Genesee county, whose term of office then expired.

Prof. E. A. A. Grange, of the Agricultural College, was reappointed State Veterinarian for two years, from the second Tuesday of July, 1887. The former cordial relations existing between the Commission and State Veterinarian have continued since our last report.

The report of that official is herewith submitted for the information of all concerned.

All of which is respectfully submitted.

H. H. HINDS.
C. F. MOORE.
J. J. WOODMAN.
The State Live Stock Sanitary Commission.

STANTON, MICHIGAN,
December 31, 1888.

OFFICE OF THE STATE VETERINARIAN,
Lansing, Mich., Dec. 31st, 1888.

To the President Michigan Live Stock Sanitary Commission:

SIR—I herewith submit the second biennial report of the State Veterinarian from March 5th, 1887, up to the present time. On May 12th, 1887, I examined the cattle of Messrs. Merrill & Rust, of Saginaw City, which had been in quarantine for 90 days on account of some importations by them from the south, and parts from which this State was protected by quarantine law. I found the cattle free from disease and in robust health.

On the 10th of June I held a post mortem on a mare said to be affected with a contagious disease, but found that the aggravated symptoms were the result of an inhuman operation which consisted in plugging the nostrils far back with small sponges.

On the 3rd of August I proceeded to Caseville, Huron county, where I found five horses affected with chronic glanders. From here I went to Ludington to examine a horse reported to be affected with a contagious disease, but after a thorough examination formed the opinion that the horse was healthy. On August 26th, at Bay Port, Huron county, I examined three horses, two of them being affected with glanders, the third one being apparently free from contagious disease. On October 9th I examined two horses in the township of Millbrook, in Mecosta county, both of which were affected with glanders.

On November 2nd I examined a horse at Mud Lake Junction which was affected with glanders. On the 22nd of November I proceeded to Three Rivers to examine a case reported to be glanders, but, after a careful examination, could not discover the symptoms of it or any other contagious or infectious disease.

On the 5th of January, 1888, I examined a horse in Quincy which was affected with glanders, and also one in Kinderhook township, Branch county, affected with the same disease. Two others that I examined the same day were apparently healthy.

On the 1st of February I examined two horses at Harrisville, Alcona county, both of which were affected with glanders. On the 22nd of February I examined three horses in the township of Cato, Montcalm county. One appeared to be healthy, one was affected with glanders, and the third had farcy. On the same day I examined a horse in Hinton township, Mecosta county, which was affected with glanders.

On the 3rd of March I examined a horse in St. Clair county which appeared to be affected with glanders. On the 6th of March I examined 12 horses in Cato township, Montcalm county, which were apparently healthy, one horse at Maple Valley which was affected with glanders; also one horse in Hinton township, Mecosta county, and one mule at Lakeview, Montcalm county, both of which seemed healthy.

On the 16th of April, I investigated a disease among cattle near Corunna, Shiawassee county, which I called bovine mucitis, the peculiarities of which were described in my last report. On the 17th inst. I examined three horses in the township of Ovid, Branch county, which were reported to be affected with glanders, but I could not discover the characteristic lesions of this or other contagious disease among them.

On the 18th inst. I examined a bay mare in the city of Hillsdale, which was affected with glanders. On the 26th of May I examined a horse in Albion, which was affected with glanders.

On the 31st of May I proceeded to examine some young cattle near Three Oaks which were thought by their owner to be affected with contagious pleuro-pneumonia, but I could not discover the symptoms of it or any other contagious or infectious disease among them. On the 1st of June I examined a horse in Beaver Creek township, Crawford county, which was affected with glanders.

On the 12th of June I examined two horses at Adamsville, Calvin township, Cass county, which were affected with glanders. At the same time and place I examined four other horses which appeared to be healthy. On the 17th of July I examined two horses in Elk township, Sanilac county; one was affected with glanders and the other appeared to be healthy. On the 18th inst. I examined three horses at Vanderbilt, Otsego county, one of which was affected with glanders. On the 21st inst. I examined a horse in Sugar Island township, Chippewa county, which was affected with glanders.

On the 31st of July I examined a horse in the township of Northfield, Washtenaw county, but could not discover the lesions of any contagious disease. At the same time and place I examined three other horses which were supposed to have been affected with glanders, but I regarded them as being healthy. On the 22nd of August, in the city of Sault St. Marie, I examined four horses which were affected with glanders, and one horse affected with farcy. In Bruce township, Chippewa county, I examined two horses which were affected with glanders.

On the 24th of August I examined a steer at Fowlerville, Livingston county, which was reported to be affected with contagious pleuro-pneumonia, but I could not discover the symptoms of it or any other contagious or infectious disease in the animal.

On the 20th of September I examined a cow at Bloomingdale, Van Buren county, thought to be affected with contagious pleuro-pneumonia, but, like the last mentioned, I could not discover the symptoms of any contagious or infectious disease in it. I examined five cows and two calves on the same farm which were apparently healthy. On the 5th of October I examined a horse in Danby township, Ionia county, which was affected with glanders.

On the 22nd of October I examined seven horses in a livery stable at Ironwood, Gogebic county; three of them had glanders, one of them had farcy, one had glanders and farcy, and two of them appeared to be healthy. On the 7th of November I examined two mares and two colts in the township of Wheatland, Sanilac county, which were reported to be affected with glanders, but I could not discover the symptoms of this or any other contagious disease in them. On the 28th of November I examined four horses in Clyde township, St. Clair county, one of which was affected with glanders, the other three were healthy. On the 11th of December I examined a horse at Ludington, Mason county, which was affected with glanders. On the 17th inst. I visited the farm of Messrs. Kneeland & Knight, of St. Johns, Clinton county, to examine a herd of cattle said to be affected with a contagious disease known as anthrax, but after examining them, both alive and dead, I could not discover any of the lesions of that disease. I would add with reference to the malady from which these cattle suffered, that, although it was of a malignant character, yet it would require further investigation to determine whether it is contagious or not; though, as many weeks have elapsed since the investigation, and as none of the other cattle have been reported sick, it is reasonable to suppose that the complaint is not communicable from animal to animal, or if it is so, that the period of incubation is longer than usual in maladies of a contagious nature.

On the 18th inst. I proceeded to the township of Harrison in Macomb county, where I examined a horse affected with glanders. On the 20th I examined a Texas pony in the city of Monroe, reported to be affected with glanders, but failed, after a careful examination, to find any symptoms of that disease.

In closing this report I desire to express a feeling of gratitude for the assistance I have received in my various investigations, and the courteous manner I have been treated by all those, who, through my office, I have been brought in contact with.

Yours respectfully,
E. A. A. GRANGE,
State Veterinarian.

THIRD BIENNIAL REPORT

OF THE

LIVE STOCK SANITARY COMMISSION

FOR THE

YEARS 1889, 1890.

BY AUTHORITY.

LANSING:
ROBERT SMITH & CO., STATE PRINTERS AND BINDERS.
1891.

STATE LIVE STOCK SANITARY COMMISSION.

MEMBERS OF THE COMMISSION.

H. H. HINDS, President,	Stanton.
J. J. WOODMAN, Secretary,	Paw Paw.
JOHN McKAY,	Romeo.

STATE VETERINARIAN.

PROF. E. A. A. GRANGE,

State Agricultural College,

Lansing, Michigan.

REPORT OF THE STATE LIVE STOCK SANITARY COMMISSION.

To Hon. E. B. Winans, *Governor of Michigan*:

Sir—The State Live Stock Sanitary Commission submit the following report of the abstract of its doings for the biennial period covering the years 1889 and 1890 as required by law.

During the period covered by this report, the general health of the domestic animals of the State may be said to have been good, as no special epizoötic has occurred to cause a sweeping loss.

Among horses constant losses are occurring from glanders and farcy and a single outbreak of what was diagnosed as anthrax occurred in a breeding establishment causing some loss.

Among cattle undoubtedly tuberculosis is quite prevalent about the State. Rabies has made it necessary to destroy a few animals. Texas or splenic fever has caused some large individual losses and actinomycoses or lumpy jaw has seemed to be epizootic in some portions of the State for the last year.

Among sheep scab seems to be frequently imported within our borders, from the ranges of the west and southwest, and a single outbreak of tapeworm carried off the bulk of the lamb crop of a single farm in 1889.

Among swine hog cholera has been quite prevalent for the period covered by this report in several counties of the State, and annually causes large losses to hog growers of our commonwealth.

DISEASE OF HORSES.

On the subject of glanders and farcy this commission can probably do no better than to quote largely on that subject from our report of two years ago as follows:

"As may be readily anticipated the principal contagious disease affecting horses reported to and claiming the attention of the Commission is glanders and its companion disease, with a different development, farcy. Glanders is a loathsome, infectious and practically incurable disease, to which not only the horse and several other of the lower animals are susceptible, but even man himself.

"Experiments and observations in this country and Europe, covering scores of years, have substantially determined that cattle are not susceptible to glanders. The horse and mule seem to afford the only avenue through which this pestilence is spread in this State. Since this part of the law has become operative scarcely a week passes without outbreaks of this disease being reported from various points in the State, and from the wide diversity of territory from which these diseased animals are reported it becomes entirely apparent that during the past years, when only the public health laws could be applied to wiping out this malady, it steadily made head against the law. Under the present law the remedy of the rifle or bleeding phlegm seems to be entirely effectual.

"It may be stated as a fact that the members of this Commission have devoted more hours of time to dealing with this particular disease among horses than they have to all the other diseases affecting our domestic animals. This commission has condemned and destroyed horses pronounced affected with glanders by the State Veterinarian in the counties of Alcona, Branch, Crawford, Calhoun, Chippewa, Cass, Delta, Gogebec, Huron, Hillsdale, Ingham, Ionia, Jackson, Mecosta, Mason Montcalm, Monroe, Muskegon, Macomb, Otsego, Sanilac and St. Clair. In some of these counties glanders were found in several different townships."

We are glad to State the fact that in the counties of Cass, Calhoun, Crawford, Delta, Ionia, Jackson, Mason and Monroe as above named the Commission have found no glanders or farcy during the biennial period now under review, but they have found it existing in the counties of Allegan, Antrim, Bay, Clinton, Genesee, Kalkaska, Lenawee, Menominee, Midland, Oakland, Oceana, Tuscola, Van Buren, Washtenaw, Wayne and Wexford, not in that list.

We further quote from our last report the following comments which two years of added experience does not incline us to change:

"The law under which we operate provides that 'whenever the Commission shall direct the killing of any domestic animal or animals it shall be the duty of the commissioners to appraise the animal or animals condemned, and in fixing the value thereof the commissioners shall be governed by the value of said animal or animals at the date of appraisement.'

"The Commission, as at present constituted, believe that a horse having glanders clearly developed has no market or selling value, is in fact worthless, and of all the horses we have thus far ordered destroyed, with four exceptions, we have awarded the nominal damage of one dollar for each case. The disposing of one of these diseased brutes is a more serious and expensive undertaking as the animal frequently has to be taken some distance from a city or village for proper burial. The ground is at times frozen deeply, the snow may be deep, or privilege of entry to woods places for burial, may be denied by the owner. These items combined, however, amount to but a small percentage of the cost to the State, thus far, in dealing with this vile disease. The great items of expense are the traveling expenses and per diem of members of the Board and State Veternarian in reaching these cases, scattered as they are, in various parts of the State.

"The Commission are unable, after giving the subject careful thought, to suggest a cheaper and at the same time safe and effectual plan of dealing with this disease. If the law was changed and authority placed in the hands of local officials it is very questionable if the State would save financially, and besides the local officials might not readily detect the disease from lack of experience in observing its characteristics. Their appraisement of values would probably cover a rather wide range, usually about the price of good sound horses, as is indicated by correspondence reaching the commission, reporting cases where probable value is stated. In fact a local board of health in a recent case reported from a distant county undertook to act for this Commission, of course without authority of law or of the commission, and determined that an aged mule had glanders and therefore ordered its destruction and appraised and fixed its value at the sum of $135.

"The statutes of some states provide and declare that a horse having glanders or farcy shall be peremptorily slaughtered without any compensation whatever. On the other hand the practice of the sanitary authorities in some states is in the line of allowing full value of animals on the basis of health, and then destroying all exposed as well as all the affected horses. The motive that leads to the adoption of this policy is founded on the theory that the plan will induce all parties having any suspicious cases to bring them forward and report them at once. This plan is of course very expensive, and tends to induce irresponsible parties to import to the State diseased and glandered horses with a view of making the State itself furnish a profitable market for these diseased brutes. Our policy has been, as before indicated, to thoroughly investigate all reported cases, and destroy only those pronounced by competent authority as already affected, while in the case of exposed animals we have held them under close watch and surveillance for a reasonable time for the disease germs to incubate. Our observations have led us to the conviction that the disease is only infectious and that a considerable number of exposed animals are not susceptible, and that being only infectious if a diseased animal were driven along the highway, if not watered at a public trough, or not hitched where healthy animals were subsequently tied, the disease might not be spread.

"The disease under our plans of dealing with it seems to be losing ground, and we feel confident that in a large per cent of the localities that we have found it, we have been able to effectually stamp it out."

The following is the detailed report as to supposed anthrax among a herd of horses as referred to in general on first page of this report:

ANTHRAX.

October 20, 1890, the commission was notified by telegraph that a new and fatal disease had appeared in a herd of thorough bred horses owned by George Canrike near Union City, in Branch county. A member of this Commission and the State Veterinarian proceeded forthwith to the place of the disease, and found that five valuable colts had suddenly died, and post mortems made by the local veterinarians Reed and French, assisted by Dr. Hurd (microscopist) convinced them that the disease of which the colts had died, was anthrax. A careful and thorough examination of the balance of the herd was made by the State Veterinarian, and no symptoms of disease was found, as his report will show, and fortunately no more cases occurred.

Anthrax is a disease known under different names, among which are black leg, black tongue, black quarter, etc., which include a group of diseases very virulent, malignant and contagious, appearing in different forms externally and internally, and attacking the different species of lower animals and man himself, in an epizootic, enzootic or sporadic manner, according to the influences that produce it, or whether it is got by inoculation "it sometimes arises spontaneously in low, damp, rich pastures and along the banks of overflowed streams, or where ponds have been drained off or dried up, the soil containing a large amount of organic matter. Long continued, warm, dry weather forming the emanations of organic matter and miasmatic gases, form its development."

The herd of Mr. Canrike was kept in a pasture, answering to the above in every particular; and it is but reasonable to conclude that the disease developed spontaneously by the surrounding conditions.

It may be interesting to notice, in the absence of a report of the autopsy, the main characteristic of this disease. The blood is black and tarry, and will not coagulate. It contains rod-like bodies (*bacteria*); and shortly before death, spores develop, which are the active part of the virus in inoculation. Blood containing these spores, has been dried, reduced to dust and kept four years, and then found to be as active as ever in producing the fatal disease. But few outbreaks of this disease have ever occurred in the United States, and it is hoped that it will never become epizootic in our State.

Since the above was put in print the following notes on post mortem examination of Mr. Canrike's horse has been received: The post mortem was made by N. N. Read, D. V. S. of Union City, ——— Spiers, V. S. of Coldwater. The blood being mounted for microscopic examination by Drs. Hurd & Ewers of Union City.

The horse was examined while the body was still warm, there appeared a dark bloody discharge from the nostrils, the tissue immediately beneath the skin was in an emphysematous condition (filled with gas), the blood was tarlike in appearance, the bowels contained a thin watery substance, the liver was soft and friable, breaking down in every direction when pressed upon with the finger, the spleen appeared like a large capsule containing a bloody tarlike substance.

The process of decomposition was going on with extreme rapidity, the characteristic odor of which could be readily detected even at this early period of dissolution.

The microscope revealed anthrage bacilli in large numbers.

Other horses presented similar symptoms of the above and the blood of those that were examined showed the specific microbe of anthrage very plainly.

DISEASES OF CATTLE.

In our last report in referring to tuberculosis among cattle the commission said:

"Undoubtedly this disease has gained a serious foothold in our State, and is causing large losses among our cattle stock. It is beyond question both infectious and contagious, particularly in the pulmonary development or consumption of the lungs. The commonly accepted theory is that it is communicable to man, not only by direct contact but also in the partaking of the milk and meat of these diseased animals. It gives us satisfaction to be able to state that some of the national experiment stations have already entered upon the work of investigation of this plague, and we hope to derive valuable knowledge from these investigations."

But little has yet been promulgated as to the results of these experiments. It is still our hope however that the experiment stations may gain valuable knowledge as to the successful treatment and prevention of this very destructive human and animal disease.

ACTINOMYCOSES OR LUMPY JAW.

The disease known commonly as lumpy jaw and scientifically as actinomycoses, and, that at the date of our last report we supposed had no foothold worth mentioning in this commonwealth has caused the cattle owners of a portion of our State very serious anxiety and considerable loss during the last year. The disease apparently became epizootic in a few counties during the last summer and its rapid spread in a few townships baffled the knowledge of the commission as to the manner of its communication, curability, etc. With a view to the more intelligent understanding of the causes of and manner of communication of this disease, this commission during last fall undertook at the experiment station at the Agricultural College, in conjunction with the station board, a series of experiments with the disease, and the same are now in progress. But little has been learned as yet by this experiment. The details of the same are set forth in the report of the State Veterinarin which is made a part of this report.

TEXAS OR SPLENIC FEVER.

Some losses have been sustained during the last two years in this State by splenic or Texas fever, but with the exception of two cases during the fair season of last fall, no single loss has been large. The first of these losses occurred at the exposition building at the close of the Detroit exposition where an entire Ayershire show herd belonging in Ohio died of the disease, and the other occurred a few days later at Pontiac, where a portion of the very valuable show herd of Hereford cattle of Sotham & Stinkney of this State died. Both of these herds were exposed at the Toledo Stock Yards while on their travels from fair to fair.

For the two years covered by this report this commission has operated in dealing with so called Texas cattle under the following rules and executive proclamation being substantially the same for both years only differing in dates.

PROCLAMATION.

EXECUTIVE OFFICE, MICHIGAN.

WHEREAS, It is made, by law, the duty of the Governor of this State, under certain conditions, to publish, by proclamation, such rules and regulations as may be made by the State Live Stock Sanitary Commission, establishing or prescribing quarantine and other regulations, to prevent the introduction or spread among domestic animals of this State of any malignant, contagious, or infectious disease; and

WHEREAS, The State Live Stock Sanitary Commission did, on May 18, adopt the following rules and regulations relating to the importation and hadling of so-called Texas cattle for the year 1889, viz.:

RULES AND REGULATIONS OF THE MICHIGAN LIVE STOCK SANITARY COMMISSION RELATING TO THE IMPORTATION AND HANDLING OF SO-CALLED TEXAS CATTLE FOR THE YEAR 1889.

It is hereby ordered by the Live Stock Sanitary Commission of the State of Michigan that the importation of so-called Texas cattle or cattle raised south of the 36th parallel of north latitude, and that have not been kept contiuously at least one winter north of said parallel, be strictly forbidden and prohibited until the first day of November next, except such of said cattle as are in transit across this State, and they shall only be unloaded in this State for the necessary time and purpose of feeding and watering, and then only in yards designated and branded "For the feeding of Texas cattle only," and to which yards no other class of cattle shall be admitted, and excepting also such of the above cited and so-called Taxas cattle as are intended for immediate slaughter, and these so-called butchers' beasts shall be unloaded only at the slaughter house or killing dock, where they shall be held in strict quarantine until slaughtered, and in no case will they be permitted to be driven or handled upon any street, highway, alley, lane or common whereby the health of any of our northern or native cattle may thereby be endangered, nor in any case will they be allowed to be pastured within the limits of this State.

The Commission take this occasion to warn and caution importers and slaughterers and all other persons who may desire to engage in this traffic, of the great danger to our cattle stock of importing Texas or splenic fever and conveying same to our native cattle, and to inform them that the importing and killing of these southern cattle, even at the unloading shute, may be attended with danger to our native cattle, and that these regulations will in no way relieve the personal responsibility for damage of any party engaged in the traffic that may result to our northern cattle from his acts under these regulations and the provisions of law under the operations of which the same are made and promulgated.

The Commission also again call the attention of all railroads and transportation companies doing business in this State to the provisions of Act No. 198, Laws of 1885, entitled "An act to regulate and provide for the carrying, yarding and feeding of so-called Texas cattle while in transit into or across this State between the first day of April and the first day of November of each year."

H. H. Hinds,
J. J. Woodman,
John McKay,
Members of the Michigan Live Stock Sanitary Commission.

Lansing, May 18, 1889.

Now, therefore, I, Cyrus G. Luce, Governor of the State of Michigan, in pursuance of the statute in such case made and provided, and by virtue of the authority vested in me by law, do hereby proclaim and publish the above cited rules and regulations to be in full force and effect, and I do hereby caution all parties engaged in the live stock trade, either as carriers, dealers, or butchers, against violating any of the provisions therein contained, under the pains and penalties prescribed by law.

[L. S.] In testimony whereof I have hereunto set my hand and caused the great seal of the State to be affixed this twentieth day of May, A. D. 1889.

C. G. LUCE.

By the Governor:
Gilbert R. Osmun,
Secretary of State.

The following government rules were in operation during the last half of the year 1889, and all of the year 1890.

U. S. DEPARTMENT OF AGRICULTURE,
Office of the Secretary,
Washington, D. C., February 24, 1890.

To the Managers and Agents of railroad and transportation companies of the United States:

In accordance with section seven of an act of Congress, approved May 29, 1884, entitled "An act for the establishment of a Bureau of Animal Industry, to prevent the exportation of diseased cattle and to provide means for the suppression and extirpation of pleuro-pneumonia and other contageous diseases among domestic animals," you are hereby notified that a contageous and infectious disease known as splenetic or Texas fever exists among cattle in the following described area of the United States:

All that country lying south and east of a line commencing on the Mississippi river at latitude 36° 30′ north, thence running westward on that parallel of latitude, being the southern boundary of Missouri, to the eastern boundary of Indian Territory, thence running northward to the southern boundary of Kansas, thence westward along said boundary of Kansas to the 100th meridian of longitude, thence southward along said 100th meridian of longitude to the southern boundary of Childress county in Texas, thence westward along the southern boundary of the counties of Childress, Hall, Briscoe, Swisher, Castro and Parmer to the eastern boundary of New Mexico.

From the 15th day of March to the 1st day of December, 1890, no cattle are to be transported from said area to any portion of the United States north, east or west of the above described line except in accordance with the following regulations: *Provided*, That these regulations shall not apply to any cattle taken into or through the state of Colorado for feeding purposes in accordance with the regulations of that state.

First, When any cattle in course of transportation from said area are unloaded north, east or west of this line to be fed or watered, the places where said cattle are to be so fed or watered shall be set apart and no other cattle shall be admitted thereto.

Second, On unloading said cattle at their points of destination, pens shall be set apart to receive them, and no other cattle shall be admitted to said pens, and the regulations relating to the movement of Texas cattle, prescribed by the cattle sanitary officers of the state where unloaded, shall be carefully observed. The cars that have carried said stock shall be cleansed and disinfected before they are again used to transport, store or shelter animals.

Third, Whenever any cattle that have come from said area shall be reshipped from any of the points at which they have been unloaded to other points of destination, the car carrying said animals shall bear a placard stating that said car contains southern cattle and each of the weigh-bills of said shipment shall have a note upon its face with a similar statement. At whatever point these cattle are unloaded they shall be placed in separate pens to which no other cattle shall be admitted.

Fourth, The cars used to transport such animals and the pens in which they are fed and watered and the pens set apart for their reception at points of destination shall be disinfected in the following manner:

(a)—Remove all litter and manure. This litter and manure may be disinfected by mixing it with lime, diluted sulphuric acid, or, if not disinfected, it may be stored where no cattle can come in contact with it until after December 1.

(b)—Wash the cars and the feeding and watering troughs with water until clean.

(c)—Saturate the walls and floors of the cars and the fencing, troughs and shutes of the pens, with a solution made by dissolving four ounces chloride of lime to each gallon of water. Or disinfect the cars with a jet of steam under a pressure of not less than fifty pounds to the square inch.

The losses resulting yearly to the owners of northern cattle by the contraction of this disease from contact with southern cattle, and through infected cars, and by means of the manure carried in unclean cars from place to place, have become a matter of grave and serious concern to the cattle industry of the United States It is necessary, therefore, that this cattle industry should be protected as far as possible by the adoption of methods of disinfection in order to prevent the dissemination of this disease.

A rigid compliance with the above regulations will ensure comparative safety to northern cattle and render it unnecessary to adopt a more stringent regulation, such as the absolute prohibition of the movement of southern cattle except for slaughter during the time of year that this disease is fatal.

Inspectors will be instructed to see that disinfection is properly done, and it is hoped that transportation companies will promptly put in operation the above methods.

Verry respectfully,
J. M. RUSK,
Secretary.

The goverment regulations relating to the branding of cars, cleansing and disinfecting of same after unloading and the very important requirement relating to the noting of the fact, on each copy of the way bill, that the car contained prescribed cattle has been entirely disregarded by the railroad companies carrying same, so far as we have been able to find out. Had the goverment officials been able to enforce these very proper regulations on the part of the transportation companies it would have very materially aided this commission in carrying out our regulations relating to the handling of so called Texas cattle in this State.

This general plan of handling so called Texas cattle has caused but little trouble and required but little attention outside of Detroit and there it seems to work fairly satisfactory at the Michigan Centrel stock yards, but the hour has undoubtedly now arrived when much greater loss than profit will ensue if the traffic is farther continued at Kings' stock yards on account of the impracticability, if not impossibility of keeping the prescribed cattle fully isolated until reshipment or slaughter.

DISEASES OF SHEEP.

During the early fall of 1889, a flock of lambs on a farm in Montcalm county, suddenly commenced dying without apparent cause, while the dams of same appeared healthy, a visit of the Commission developed the fact that these lambs were constantly voiding segments of tape worms. The lambs were immediately isolated from the old sheep and two specimens were shipped by express to the State Veterinarian at Lansing for treatment or post mortem.

One lamb died before treatment could be administered and the other soon after treatment had commenced. Both lambs were terribly infested with tape worms, and specimens slaughtered at the farm by the State Veterinarian while yet appparently well showed the same conditions.

It was the purpose of the Commission to institute very thorough experiments at this farm with the 30 remaining lambs to determine if possible the probable cause of the outbreak and to establish a line of treatment to relieve the infested animals of these fatal parasites.

The breeder and owner of these lambs was temporarily absent from home and claimed subsequently that he had disposed of his interest in this stock to some drovers and shippers and before the experiments were undertaken and entirely unanticipated by the Commission the shippers had removed these lambs to an eastern State.

The following correspondence relating to tape worm in sheep in general and this case in particular is submitted and fully explains itself:

Office of E. A. A. Grange, State Veterinarian,
Lansing, Mich., August 15, 1889.

Hon. H. H. Hinds, *President State Live Stock Sanitary Commission, Stanton, Mich.:*

Sir—In accordance with instructions recently received from you I proceeded to investigate the outbreak of disease in lambs at Lakeview, Montcalm county, and upon examination of some of the affected animals, both anti-mortem and post-mortem, I found them infested with tape worms, known in science as the variety *tænia expansa*, which cause in sheep a disorder called "Tape worm plague," a very fatal complaint which if not arrested in the very earliest stage, often baffles all efforts to effect a cure.

With regard to the life history of the parasite in question, I regret to have to say that there are some features of it still in doubt, which perhaps puts us at considerable disadvantage in wiping out the cause and thus preventing future invasions, but I will endeavor not to leave a stone unturned in the discovery of the cause, as well as the cure of this complaint.

Yours respectfully,
E. A. A. Grange, *State Veterinarian.*

Stanton, Mich., August 20, 1890.

Dr. D. E. Salmon, *Chief of the Bureau of Animal Industry, Washington, D. C.*

Dear Sir—I have to report a disease new to me among sheep, viz: Tape worms in fatal numbers. One J. H. Jenson, a farmer living twenty miles from here, had, a month ago, a flock of 61 apparently healthy coarse wooled lambs, running near his house, with their dams. Suddenly one was taken sick and died, followed by five of its mates, and within a week half the lambs were dead, while the old sheep appeared still healthy. I investigated the matter and found the dead lambs had large numbers of tape worms in the small intestines, and that the live lambs were constantly passing segments of tape worms with almost every evacuation of the bowels. Some scoured badly. The sick ones only lived about two hours after being attacked. I shipped two lambs to the State Veterinarian, one for post-mortem on arrival, and the other for treatment. The post-mortem showed large numbers of the worms in the bowels, some 6 and 8 feet long, and in one place 12 lay side by side. The one under treatment died same as those at the farm.

One-half of the lambs are still alive, but are still passing parts of worms. They appear healthy and none have died for the last ten days. The dams are now isolated from the lambs and do not seem to pass any worms in their evacuations.

What do you say as to this outbreak and what do you advise in regard to farther investigations and treatment?

Very respectfully,
H. H. Hidns, *President of Commission.*

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY.
Washington, D. C., September 6, 1889.

Hon. H. H. Hinds, *President State Live Stock Sanitary Commission, Stanton, Mich.*

Dear Sir—Your favor of the 20th ult. I find on my desk on my return from an absence of some weeks. The most noticeable point in the statement which you make of the deaths from tapeworm in lambs is the short time during which they are noticed to be sick. The usual course of the disease is a progressive anæmia, the animal gradually wasting away and dying. If the lambs in question were sick but two hours, I should think there was some other cause besides the tape worms to account for the death of the lambs. We frequently find this species of tape worm and have been carrying on some experiments with it at our station here. It would be interesting to treat the animals with turpentine and other medicines generally recommended for killing and dislodging this class of parasites.

Very respectfully,
D. E. Salmon, *Chief of Bureau.*

Paw Paw, Mich., Sept. 20, 1889.

Hon. James H. Wade, *Secretary Michigan University, Ann Arbor, Mich.*

Dear Sir—Our State Live Stock Sanitary Commission has a case in hand which is new to the flock-masters of this State, although not unknown to veterinary and medical science. In a flock of about 60 lambs, nearly one-half of them died within a few days, and the remainder of the flock were sold and shipped to be slaughtered for mutton. We deem it due, not only to the stock-growers of the State, but to veterinary and medical science, that all available information relating to the cause, nature and injurious effects of these destructive worms be collected and placed before the public. Hence we ask you to place this matter before the medical faculty of the university, and request them, if practical and convenient for them to do so, to give us information upon the following and such other points as they may deem important:

First, Is the tape worm which infests domestic animals the same species as those which trouble the human family?

Second, Do the segments of the worms, after passing from the animals by evacuation, have vitality and power to move about and deposit eggs upon the grass and earth, and if so, would not the health of other domestic animals feeding upon the grass be endangered?

Third, If eggs laid by the segments of the worms, or falling upon the earth by the evacuation of the animal, infect the field, how long would it be necessary to keep all live stock from such field to obviate the danger of infection to other animals? Would plowing and culivating the field destroy them at once?

Fourth, If they are the same species that trouble the human family, is there not danger of conveying the worms into the human stomach by using for food the flesh of sheep and other animals carrying them?

Fifth, Is there any known remedy by which domestic animals can be safely and effectually relieved of tape worms?

Your compliance with this request will be a special favor to the commission and the information given by the medical faculty of the University will be regarded as the highest and most reliable authority which can be obtained.

Yours most respectfully,
J. J. Woodman,
Secretary of the State Live Stock Sanitary Commission.

UNIVERSITY OF MICHIGAN,
DEPARTMENT OF MEDICINE AND SURGERY,
Ann Arbor, Sept. 26, 1889.

J. J. WOODMAN, ESQ.:

DEAR SIR—Your letter of the 20th inst. to the secretary of the University, Mr. James H. Wade, was handed over to the Medical Faculty and read at our meeting yesterday. It was decided that your letter should be given me to answer. I will endeavor to do this as fully as possible.

First, Is the tape worm which infests domestic animals the same species as those which trouble the human family? To answer this question it is necessary to state that the life of a tape worm consists of two distinct stages passed in two distinct forms, and each stage is passed in a different species of animal. Thus in man there are found two species of tape worm, *tænia saginata* and *tænia solium*. They exist in man in the fully formed or segmented state, but they had previously lived in a cystic or bladder form in other animals, *tænia saginata* in the ox, and *tænia solium* in the pig. In the same way *tænia cenurus* is found in the dog in the mature form, while the bladder form is found in sheep. The bladder form gives rise to what are called "measles" in pork and "staggers" in lambs. From this you will see that the mature form of tape worm found in man is never found in the domestic animals. Ruminants, from the clean nature of their feeding, are peculiarly free from tape worms which are principally found in the carnivora, insectivora and omnivora. Cases are however on record where the mature form of *tænia expansa* has been found in sheep.

Second, (*a*). Do the segments of the worms passed by the evacuation of the sheep or other animals have the vitality and power to move about upon the earth, and grow and deposit eggs? Each segment of a tape worm contains both male and female organs. Copulation takes place in it; the fertilized ova pass into the uterus; this enlarges as the ova increase in size, and the male organs become absorbed; the segment is then ripe and filled with ova. By this time the segment is ready to leave the body of the animal containing the mature worm; it is deposited in various places; the segments have the power of crawling out of the fœces and depositing the ova on stalks of grass, etc.

(*b*.) And if so would not the health of other domestic animals feeding on the grass be endangered? From what I have said it will be seen that there is great danger to domestic animals feeding on grass infected in this manner, but not from tape worms coming from the same species of animal. The worms mentioned in your letter as passed by the lambs would have no power to infect other lambs, but would infect some other animal, not with segmented worms, but with the bladder form. In this manner four forms of tape worms which inhabit various kinds of dogs, infect grass feeding ruminants. The eggs of *tænia saginata* of man will affect the ox, the eggs of *tænia solium* of man will affect the pig, but always with the bladder or cystic form; then if the flesh of these animals is eaten by man, without sufficient cooking, the mature tape worm is again developed in him.

Third, If eggs laid by the segments of the worms or falling upon the earth and vegetation by the evacuation of the animals, infect the field, how long would it be necessary to keep live stock from such field to obviate the danger of infection to other animals? Would ploughing and cultivating the field destroy them at once? The eggs of tape worms usually lose their vitality in a few weeks, even when kept moist. This is the generally received opinion, although Davaine has stated that he kept the eggs of some tape worms for years in a living state. Plowing and cultivating the field would prevent the danger of infection even if it did not destroy the eggs, as they are only dangerous to cattle and sheep when placed on the grass they eat. This would however only prevent infection with the bladder form. In the present case the lambs are affected with the mature form, or the tape worm itself. They must, in this case, have eaten or drank something which contained the cystic form of the worm, as from this alone the mature tape worm is formed. The bladder worm is taken into the stomach and the cystic part is dissolved by the gastric juices. The head remains and has the power of forming segments, which grow from it. Consequently the segment farthest from the head is the oldest. In some forms of tape worm in man the cystic form has not been worked out yet, but is supposed to come from the water or from fish. It may be in this case that the infection has come in some manner with the water drank by the lambs. In all probability the bladder worm existed in some small mollusk or insect taken in with the drinking water.

Fourth, If they are the same species that trouble the human family, is there not danger of carrying the worms into the human stomach by using the flesh of sheep or other animals carrying the worms? The tape worm affecting lambs is the *tænia expansa*, and I know of no case in which it has occurred in man, either in the adult or cystic form. There is no danger to man from eating the flesh of an animal affected with the adult form, that is of infection.

Fifth, Is there any known remedy by which domestic animals can be safely and effectually relieved of tape worms? The remedies for tape worms are many and various, depending on their ability to destroy the worm without affecting the health of the animal containing it. The rationale of the treatment is: First, To have as little food as possible in the alimentary canal. For this purpose an animal like the sheep should fast for several hours before receiving the medicine. Second, Each animal should receive a proper dose of the medicine, and for this purpose should be drenched singly. Third, After receiving the medicine the animal should be kept for an hour or two in a place where they could get no food, so as not to interfere with the action of the medicine. As to the medicine used, according to H. J. Detmer, sheep will stand large doses of tartar emetic, and he advises the administration of a solution of tartar emetic, one-half a pound in 12 quarts of rain water, giving from one to two ounces to each lamb, to older sheep a little more. Prof. Gerlach, of Berlin, advises creosote in the drinking water, and considers 2½ ounces a sufficient dose for 100 sheep. Turpentine is very efficacious, but must be given as an emulsion. A decoction of pomegranate bark will also act well. Oil of male fern, Kousso, picrate of potash, and many other remedies have been tried and found effectual. I think from my experience in the treatment of tape worm in man that the main thing conducive to success is to have the worm sufficiently exposed, that is, not imbedded in food or mucus. When this is assured, any drug that will kill the worm can get at it to do so. The ease with which tartar emetic can be administered and its small cost, would induce me to try it if I ever had occasion to treat animals in this condition.

I have now given you all the information in my power, and I trust it will suffice. I shall be happy to answer any further questions on this or any subject connected with the diseases of animals, in which I am much interested and have worked for many years. I remain, dear sir,

Yours faithfully,
HENRY GIBBES, M. D.,
Professor of Pathology.

SCAB.

Complaint has been made to the Commission, that western sheep afflicted with scab are annually imported into this State and fed during the fall and winter months and reshipped to market. As the disease can be subdued by thorough treatment, the action taken upon the cases reported has been to require perfect isolation from all other sheep during treatment, care in driving upon the public highways and thoroughly disinfecting all stables, pens and yards where they have been kept. It is evident however that there is a growing apprehension among the flock-owners of the State, that these importations of diseased sheep may result in great damage to the well-earned reputation of our Michigan flocks, if not in spreading disease among them; and yet to prohibit the importation of sheep for feeding purposes, would be a heavy blow to an important agricultural industry of our State and should be well considered by all engaged in sheep-husbandry, and the nature of the disease thoroughly studied and well understood before demanding full prohibitory measures.

The following from the report of Dr. D. E. Salmon, chief of the National Bureau of Animal Industry, will be interesting in this connection:

"Of all the diseases of sheep in this country, scab is the worst feared by the flock-master. So insidious in its attack, so rapid its course, so destructive its effects, and so difficult is it to exterminate that it has justly earned the distinction of being more injurious than any other disease caused by external parasites. Scab alone, of the parasitic diseases, has become the subject of legislation in most countries; and yet, if proper precautions were taken and a radical treatment followed, this disease could soon be completely eradicated."

The disease is caused by an insect known as scab-mite, or itch insect

(Psoroptes) and communicated by the affected animals coming in contact with each other, rubbing against posts, fences and etc., and dropping tags of wool by the wayside. Upon the length of time the insect will live after being separated from the sheep, authorities seem to differ. Dr. Salmon says:

"Experiments show that they can live on a piece of scab at a moderate temperature from ten to twelve days, and about sheep pens and yards from twelve to fifteen days, and after being subjected to intense cold;" while the authors of the American cyclopedia of live stock, say: "The insect is so tenacious of life that it has been said to have remained in a pasture three years and then spread the infection."

Treatment: To effectually cure the disease every sheep in the affected flock should be immersed in a liquid solution to kill the insect, the stables, pens, and yards should be thoroughly disinfected, and the dipping repeated in six or seven days. Hence it will be seen, that to eradicate the disease from a large flock of sheep requires much labor, great care, and considerable expense; and it is but reasonable to infer that the work is seldom done thorough enough to effect a permanent cure. If importations from infected districts are to continue, it may become necessary to provide a system for inspecting the sheep before they enter the State or enforce such quarantine and other sanitary measures as may be deemed necessary to protect our native flocks from the infection.

DISEASE OF SWINE.

SWINE PLAGUE OR HOG CHOLERA.

During the past season, hog cholera has prevailed to some extent in several localities in the State, destroying a considerable number of swine. The disease is very contagious, rapid in its work and generally fatal in its results. It is caused by a specific microbe multiplying in the body of the diseased animal. It belongs to the *germs bacterium*, and has the power of spontaneous movement. It is so tenacious of life that it will live in water, and in a dried condition for an indefinite period, and be carried from field to field, and from farm to farm, by water courses, flesh devouring animals, birds and insects, if not floated in the atmosphere; and when taken into the stomach of the swine, in food or drink or inhaled into the lungs, or injected into the circulation by flies and gnats, will incubate and produce the disease. There is but little doubt, but what the disease may be produced spontaneously by filthy environments, and when once started in a locality, the means for accelerating its spread are so numerous, imperceptible, and consequently uncontrollable, that no one can tell what the limit of the contagion will be, or where its destructive work will end.

Treatment: It is generally conceded that the cheapest and most effective remedy for the disease, is to kill and burn or deeply bury the affected animal as soon as the symtoms of the disease develop; and the most effective means to prevent its spread, is to enforce close quarantine of every affected herd, separate the sick from the well, preserve cleanliness in all the surroundings, and thoroughly disinfect all pens and yards where the diseased animals have been kept.

The Commission will spare no effort to obtain all of the available information relating to the nature, treatment, and preventives of this disease which is possible, and give the same to the public as occasions may require but at present, cannot with confidence, recommend any specific for the disease, nor preventives further than to enforce rigid sanitary measures.

Mr. C. F. Moore of St. Clair resigned as a member of this commission in February, 1889, and Mr. John McKay of Romeo, Macomb county, was appointed to the vacancy, and confirmed by the senate, his term of office dating from February 16, 1889, and running to the second Tuesday of July 1891.

Mr. H. H. Hinds of Stanton, Montcalm county, was appointed to succeed himself as a member of this commission for the period of six years from the 2d Tuesday of July, 1889.

Prof. E. A. A. Grange of the Agricultural College, Lansing, was reappointed State Veterinarian for the term of two years from the 2d Tuesday of July 1889.

The report of that official is herewith submitted for the information of all concerned.

All of which is respectfully submitted.

H. H. HINDS,
J. J. WOODMAN,
JOHN McKAY,
The State Live Stock Sanitary Commission.

LANSING, MICH.,
MARCH 31, 1890.

REPORT OF THE STATE VETERINARIAN.

Lansing, January 1, 1891.

Hon. H. H. Hinds President of the Michigan Live Stock Sanitary Commission:

SIR—Since submitting my second biennial report I have had occasion to visit many counties of this State, for the purpose of investigating alleged outbreaks of contagious disease, in the various classes of our domestic animals. Among horses, I have condemned some forty-eight animals, as being affected with that loathsome disease known as glanders. Among cattle I have condemned a few head as being affected with a disease similar to consumption in man,. but generally called tuberculosis when affecting bovines. Of this disease, I may say that recent investigation, by eminent scientists, has gone to show beyond all reasonable doubt, that it is of a communicable nature, and consequently should be dealt with on the highest sanitary principles, though, perhaps fortunately for us, it does not appear to be a disease of a very highly contagious nature, yet it is so insidious in its invasion of the economy of an animal, and so disastrous in its results, that I think we are thoroughly justified in disposing of animals affected with it, in a somewhat summary manner. In fact I recommend death, and cremation, in all cases where the lower animals are affected. I am glad to be able to say, though, that very few cases of it have been brought under my notice, in this State.

I have also had occasion to investigate an outbreak of rabies among cattle, the result of wounds inflicted by a mad dog.

I was called upon last fall to investigate a supposed outbreak of anthrax among horses and from the description I got of the actions of the animals, before their death, and the post mortem lesions, led me to believe that this disease was the cause of their complaint. In them the disorder ran its course so rapidly, that the last one was dead before I reached the scene of the difficulty, notwithstanding the fact, that I arrived at the spot, as soon as it was possible to do so, after receiving instructions to proceed.

Earlier in the season I was instructed to proceed to Milan, in the southern part of the State to investigate a supposed outbreak of contagious pleuro pneumonia in cattle, but I was soon able to determine that this much dreaded disease did not exist among the affected herd.

Upon learning the peculiarities in connection with the symptoms in the diseased creatures I was at once impressed with the idea that I had more than a common cattle disease to deal with. and upon further inquiry, as to surrounding circumstances, etc., I was informed that this outbreak was in the same locality, as that which became notorious a year or two ago on account of a disastrous invasion of tyrotoxicon poisoning in the family of

Wm. Evans, most interestingly described by Dr. Vaughan of the Michigan University in the report of the State Board of Health. This disease has never been described as affecting the lower animals that I am aware of, but upon receiving an account of the symptoms in the Evans family from one of the survivors of the outbreak, I was struck with the close resemblance they bore to the affected cattle, but more particularly to the farm dog, which I was told partook somewhat freely of the carcass of one steer that died; the dog, a great favorite, was soon striken with disease, and for some days his life was despaired of, though when I saw him, he was convalescing slowly, as were also the surviving cattle. Another interesting fact in connection with this outbreak is, that the old farm house, in which the disease first made its appearance, in the Evans family, was condemned as being unfit for human habitation, but was thought good enough for a cattle shed and was converted into one; whether this had any connection with the disease in the cattle or not, is impossible for me to say, but the fact still remains, as food for thought. Owning to the sudden death of some of the animals and the somewhat rapid recovery of others, I had not the opportunity of investigating this disease to the end, or to the extent that I desired.

I have also been called, on a number of occasions to investigate alleged outbreaks of actinomycosis and have condemned a number of animals as being affected with it.

The light which recent investigation has thrown upon this disorder has brought it before the public in a more serious form than was even dreamed of a few years ago. Owing to what appeared to be an increase of the disease in this State, as well as from the fact that there are many features of it still wrapped in the greatest obscurity, the Michigan Experiment station, in consort with the live stock commission, has undertaken an investigation of this disorder, but sufficient time has not elapsed yet for definite results, though many experiments are now in progress. These experiments have been directed: First, towards the cause of disease; second, to determine if the disease is communicable from animal to animal; third, to determine as far as possible what animals are most susceptible to it; fourth, to determine if the poison will grow upon grass or other aliment at ordinary temperatures, or to discover if possible the most favorable substance for the poison of this disease to exist or thrive upon; fifth, to test the effect of cooking upon the microbes, and determine, if possible, what degree of heat is required to destroy them. These and like questions will no doubt be settled ere long.

This disease has created so much comment in legislative halls, agricultural newspapers and other places, that for the information of those who are not familiar with its peculiarities I have taken the liberty of incorporating in this report a general outline of symptoms, etc., in connection with it.

ACTINOMYCOSIS

is a disease which has been known for many years under a variety of names, such as osteosarcoma, lumpy jaw, wen, as well as others perhaps not necessary to mention here. These names have been given to the disorder owing to certain peculiarities in connection with individual outbreak, but recent investigation has gone to show that they are often inappropriate, and even misleading, when the cause and peculiarities of the disease come to be considered. The name lumpy jaw is the one oftenest used to describe the complaint in this country by those who prefer common to scientific terms, but it is not always appropriate, for many animals suffering from it, are not affected in the jaws in any way, neither is the term osteosarcoma always strictly correct, for this compound expression means (literally translated) partly bone and partly flesh, but in many instances the tumors associated with it, are composed entirely of flesh or soft material, while the term wen is a somewhat ambiguous expression, applied to tumors of every variety; but the name actinomycosis seems appropriate in all instances, since it refers to the cause of the disorder, without regard to the size, composition or situation of it. The above disease is one which has been undergoing a good deal of investigation upon both sides of the Atlantic the last few years. This increased interest in this complaint is the outcome of certain assertions from trans-Atlantic investigators to the effect that the disease is communicable from animal to animal, and even from animal to man himself; in other words, that it is a contagious or infectious disease.

The name actinomycosis, when somewhat broadly translated, means a radiating fungus, composed of club-shaped microscopic bodies so arranged that they have been, I think, appropriately likened to a flower of the daisy order, as they appear in the field of the microscrope. These little bodies are claimed by botanists to be of a vegetable nature, and have been known to grow upon barley as well as other grains, but it is a very difficult matter to grow them artificially, many failures having maked the efforts of men on this as well as the other side of the Atlantic, though some have been more successful, and Prof. Boström is reported to have grown the antinomyces artificially.

It being conceded that these minute club-shaped bodies, actinomyces, are the cause of this disease, the question arises as to how they find their way into the animal economy, but the tongue as well as other parts of the mouth, such as the jaws, being so often affected, has suggested the idea that they are taken into the mouth with the food, and if there is an abraded surface on the tongue, lining of the cheeks, gums, etc., it forms a suitable field for the microbe to grow in, which it often does, and flourishes in a most prolific manner. Then, on the other hand, it is not to be supposed that because an animal eats the little bodies which cause this disease that they will be sure to contract it; indeed, on the other hand, feeding experiments have failed, over and over again, to produce the disorder, probably because the entire alimentary canal was intact, and the actimonyces could not gain access to the blood, or find a suitable habitat to continue their existence.

Then, again, if the skin on the external surface of the body is abraded in any way, perhaps upon the neck, through the rubbing of the stanchion or chain around it for securing the animal, the microbes through some means of migration, caused by moving fodder, currents of air, or other conveyor, settle upon the abraded surface, and finding a fertile soil for their development start to grow, and we soon have the tumor so often called lumpy jaw; of course abraded skin in any part of the body is liable to be affected in the same way.

SYMPTOMS.

I do not know another disease the symptoms of which are more difficult to describe in a general and comprehensive way than the one in question. This is probably owing to the fact that it invades nearly all, if not all, the organized tissues of the body. It is found outside upon the skin, mammary glands and other parts; while the interior organs, such as the tongue, throat, lungs, bowels, etc., are often affected. But upon a close examination of the substance of the material causing the tumors it will be found, when cut across with a sharp knife, to be composed of a nodular substance having a somewhat granular aspect. We also find the tumors associated with this disease, forming sacs of variable size, having thick walls and enclosing a jelly-like pus.

When the disease attacks the tongue, that organ will be found indurated (hardened) more or less, throughout its entire extent, and numerous little roundish bodies will appear imbeded in the substance of it. Continuing on through the digestive tract we will find little nodules or tumors associated with any or all of the organs connected with this canal, varying in size from say a pea to a walnut.

THE ORGANS OF RESPIRATION

are also often the seat of this disease, and when they are affected we sometimes find tumors forming in close proximity to the throat in such a way as to partially block up the air passages, and cause the animal to breathe with a loud, snoring sound. I have met with cases where tumors formed at the junction of the bronchial tubes with the trachea, or wind pipe, which caused the animal to cough upon the slightest provocation, especially the dust evolved from ill-gotten hay and the like.

The lungs themselves are also attacked, and in those cases which I have had an opportunity of examining, hard indurated masses were present, forming sacs with matter in them and often of considerable size.

THE HEAD.

When the external surface of the head, upper or lower jaw, is affected, the bones frequently become involved, giving rise to the most loathsome looking sores having a discharge issuing from them mixed with the debris of bone or soft tissue. The bones themselves when freed of their surrounding tissues, by boiling or otherwise, present an exaggerated, honey-combed appearance, and are frequently distorted beyond recognition, though in many cases of diseased heads, the tumors are entirely free of the bones, being loose and easily moved from side to side.

Actinomycosis attacks other domestic animals as well as cattle, but it is oftenest found in the bovine race.

OF THE TREATMENT

I have to say that I do not think it is a question of what can be done, but rather it is a question of what ought to be done. I do not intend to say that this is an incurable disease, far from it, for it will yield to judicious remedies in many instances without much difficulty when it is of a purely local nature and the bones are not affected; but when we add to this that in a large proportion of animals affected with these tumors on the outside of the body, the internal organs are also affected, and as the disease may exist even to a considerable extent in the interior economy of an animal, without manifesting itself through symptoms, we can then appreciate the difficulty in forming an opinion just as to when the case is really cured; and when we take into consideration the risk to man and beast, when this disease is in a herd, the question soon resolves itself into the one "does it pay to treat them?"

When treatment is determined upon I think the quickest and surest way to get rid of the tumor is to dissect it out and dress the wound with antiseptic remedies.

Among sheep I have been called upon to investigate a serious outbreak of tape worm plague at Lakeview, in August, 1889. This is the first outbreak of the complaint that my attention has been called to in this State, though the disorder has been brought under my notice in other parts a few years ago. As this disease has not been before our flock-masters at any previous period, to my knowledge, it may be well at this time to give an outline of some of its more salient points.

The parasite causing this disease is known to science as the *Tænia Expansa* (when freely translated, "an expanded ribbon-like object"), commonly called a tape worm. This is one of the many tape worms that infest sheep and it is found generally in the small bowel, sometimes in considerable numbers. I have counted as many as twelve of them lying side by side, almost entirely blocking up the canal for the passage of food, which obstruction no doubt causes the digestive troubles and colicky symptoms so often manifested in this disease. In length some that I had were estimated at ten feet, though I believe they often grow longer. When they attack sheep they do not always produce acute symptoms except where they are in considerable numbers. I have known them to set up intestinal irritation sufficient to cause the death of an apparently healthy and even vigorous lamb, in the course of about four hours, causing in the meantime distressing colicky pains, more or less fluid evacuations mixed with segments of the worm, one or two feet long, the irritation of the digestive tract being accompanied with distressing tenesmus, and the animal thrown into a state of exhaustion from which it soon succumbed. On the other hand the disease often assumes a more chronic form, during which the sheep will drop into a debilitated condition, eventually dying of marasmus.

The life history of the parasite is still wrapped in obscurity in some particulars; for instance, the intermediate host necessary for the production of typical cases of tape worm is unknown, some being inclined to think they are fresh water snails or slugs, which has caused me in the past to examine these creatures for evidence of disease, but up to this writing have been unable to discover evidence enough to even arouse my suspicions; then again the intermediate is thought by some to be the tick, with which many sheep are infested, and the reason that lambs are oftener affected than older sheep, is because they are continually mouthing the skin of their mothers, at the udder or other parts, but positive proof of this has not been established. It was my intention to have followed this point up among others, had not my plans been cut short by such unforeseen circumstances as the removal of the flock to an eastern market and since then the opportunity, perhaps fortunately, has not been presented.

OF THE TREATMENT of this disease I have little to say at present, except to recommend the usual remedies for tape worm, which I may add have been used from time to time in many countries with variable success. I think that the secret, in the successful treatment of this disease, is beginning early, and having the bowels comparatively empty before the vermifuge medicine is given.

In closing this report I desire to express my gratitude for the assistance I have received in many directions while pursuing the details of the work before me.

Yours respectfully,
E. A. A. GRANGE,
State Veterinarian.

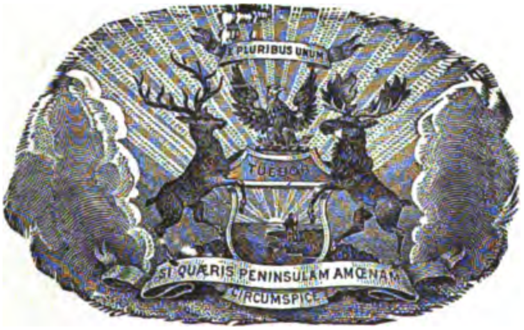
FOURTH BIENNIAL REPORT

OF THE

LIVE STOCK SANITARY COMMISSION

FOR THE

YEARS 1891, 1892.



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MEMBERS OF THE COMMISSION.

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J. J. WOODMAN, Secretary,	PAW PAW.
J. E. BARRINGER,	ARMADA.

STATE VETERINARIAN.

PROF. E. A. A. GRANGE,
STATE AGRICULTURAL COLLEGE,
LANSING, MICHIGAN.

REPORT OF THE STATE LIVE STOCK SANITARY COMMISSION.

To Hon. JOHN T. RICH, *Governor of Michigan:*

SIR—The State Live Stock Sanitary Commission submit the following as their fourth biennial report covering the years 1891 and 1892:

During these years no specially noticeable outbreaks of animal diseases have occurred to cause very serious individual losses or to attract public attention.

HORSES.

The experience of former years has again been gone through with in relation to glanders and its kindred disease, farcy. No other equine diseases have claimed much attention from the commission.

CATTLE.

Less reports of disease among the bovine stock of the State have been reported to the commission than for any other biennial period of its existence.

SHEEP.

While the general health of this branch of our live stock industries has been excellent, very serious losses among the half grown lamb crop of 1892 was caused by internal parasites in the form of tape worms and thread worms.

HOGS.

Quite extensive areas of the State suffered from losses by hog cholera during the year 1891, but during 1892 very much less has been reported.

DISEASES OF HORSES.

GLANDERS.

The fact is again to be stated that glanders alone occupies more of the time and attention of this commission and the State Veterinarian, and costs the State much more, than all the other animal diseases which are brought to our notice combined. It had long had a foothold in this State before the enactment of live stock sanitary laws, and in the nature of things can readily be transplanted from one county to a distant one by simply transferring ownership of a glandered horse from one locality to another. In December, 1891, the Michigan Agricultural Experiment Station, located at the Agricultural College, issued Bulletin No. 78, entitled Glanders and Farcy. The author of the bulletin was Prof. E. A. A. Grange, who, while being in charge of the veterinary department of the college and station, is also State Veterinarian. This commission deems this treatise of so much importance, and so plain and simple, while yet comprehensive, that we herewith reproduce the article and make it a part of this report and commend its careful perusal.

GLANDERS AND FARCY.

(Michigan Agricultural Experiment Station, Bulletin 78.)

Owing to the repeated inquiries coming to this department for information, concerning the various phases of the above diseases, it has been deemed advisable to point out the principal features in connection with them, through a bulletin, and for those who are not at all familiar with these complaints, several colored plates have been added, showing some of the most important lesions which occur in typical cases.

Before describing these disorders it may be well to state that investigators in all parts of the world, have concluded that the two complaints are only different manifestations of one and the same disease; this has been shown time and again through the operation of inoculation, where the discharge from a farcy bud was implanted beneath the skin of a healthy and susceptible animal, and glanders in the course of time would make its appearance. On the other hand, if the discharge from a glandered animal was manipulated in the same way, farcy would be liable to follow; though it is not to be inferred that because we inoculate with the virus of farcy, we will of necessity get glanders, or *vice versa*, indeed, you may have both manifestations of the disease, in the same animal at the same time, no matter whether the operation is performed with glanders, or farcy virus.

The term glanders is applied to the disease when the interior of the nose, the lungs, or other portions of the organs of respiration are affected, while the term farcy is used when superficial parts, the skin, etc., of the body are invaded. As I inquire into the nature of the two diseases, farcy appears to me to bear about the same relation to glanders, as lupus does to pulmonary tuberculosis in the human family.

Glanders is a disease which is invariably described as belonging to the equine race, and that it is transmitted from it to other animals; just what grounds there is for this assertion is not made clear, though it may be accounted for by the fact, that the disease has been recognized for centuries as a malignant disorder amongst horses, while it has not been even suspected amongst other animals, until a comparatively recent date; indeed, it is only within the last seventy years, that the disorder has been recognized in the human family, when in 1822, it was first described by Schilling, but it is not to be supposed for a moment that this was the first invasion of the human family by the microbe of this disease; indeed, it may be regarded as an open question whether the human race first contracted it from the equine, or the equine from the human. We are told in second book of Moses (presumably written about 1,600 years before the christian era) that the ashes which he, Moses, took from the furnace and sprinkled before Pharaoh became a boil breaking forth with blains (*pustules*) upon man and beast. Now, if these blains, or pustules, were the same as we recognize in the glander-farcy pustules, why surely the human race has as much to do with the origin of the disease as the equine.

Glanders is known under a variety of synonyms, but the only one that we are concerned in, besides farcy, is the term *Equina*, which is given to it when it invades the human race, although the term *Malleus humidus*, used by early writers, might be an appropriate one to call the complaint at the present day, not only because *malleus* has reference to evil things, and *humidus* applies to the moist discharge, but because the discoverers of the micro-organism which causes the complaint, have given it the name of *bacillus mallei.*

The geographical distribution of this disorder, was somewhat limited until the commercial intercourse between countries, began to assume evtensive proportions, and now that horses are so easily exported from one part of the world to another, we find this disease disseminated with them. It is said not to have been know in America, till the close of the last century; since then, through the exposure of military campaigns, shipping horses from one part to another, etc., etc., it has become pretty generally diffused over this continent. Condemned horses from the United States army, at the close of the late civil war, are credited with having distributed the virus of glanders, far and wide.

THE CAUSE.

of this disease, has been wrapped in the greatest obscurity until very recently; indeed, it was not until the year 1882, that the microbe causing it, was isolated, cultivated, and otherwise shown, to be the sole factor, in the production of the complaint. But even supposing that the *bacillus mallei*, is the direct cause of this complaint, we must not forget that improper sanitary surroundings have a great deal to do with the development of the disease. We think it reasonable to suppose that those environments which are not conducive to robust health are likely, perhaps indirectly, to cause glanders, for they will deplete an animal in such a way as to render it more susceptible to the influence of the *materies morbi*; hence catarrhal fevers are liable to run on to glanders. Sometimes an animal depleted by a severe operation will contract it. At one time it was thought that the crowding of horses in the hold of a ship, with the hatchways closed, owing for instance to inclement weather, would be almost certain to cause this disease, but if we are to place any reliance in the germ theory of the malady, then such crowding as a cause of it must at once be discarded, though the surroundings would be most favorable to the growth of the germ, if present.

Again, long military campaigns were thought to be a fertile source of the complaint, and no doubt they are, but, I must add, indirectly. That military campaigns serve as excellent institutions for the dissemination of the disorder cannot be denied, with the statistical information we have of the marked increase in the number of cases during the recent civil war of this country, also in the Franco-German war, the Crimean war and hosts of other similar engagements, all bear evidence pointing in the same direction, which is no doubt to be accounted for largely by the depleting influence of hard work, and comparatively poor care the horses get; then the huddling together of vast numbers of animals gives a favorable opportunity for the spread of the microbe from animal to animal. Glanders has long been regarded as a communicable disease, but to prove its contagious nature, a somewhat interesting experiment was tried at the Alfort veterinary college, where several hundred apparently sound horses had some glandered ones turned amongst them; in time the disease spread to such an extent that its contagious nature could scarcely be denied.

The question, can one animal contract the disease from another by simply breathing its breath, is often asked, but the experiment of Renault goes to show that healthy horses can breathe the breath of their glandered neighbors with impunity, and not contract the disease. The experiment was conducted by arranging tubes of canvas, in such a manner as to force a large number of healthy horses, to breathe the expired air of glandered ones for an hour and a half each day for seven days, but he was unable to produce the disease in a single instance. It would be dangerous to conclude from the above experiment, that expired air of a horse with glanders is safe under all circumstances, for while it may be, and probably is, when sent for some distance through a canvas tube, yet if a horse snort, or sneezes, or even breathes unusually hard, it is more than likely that the expired air, for the time being, will be loaded, to a greater or less extent, with the microbes of the disease, and then it is very dangerous, being poisoned with this *contagium*; but if this same air be filtered through the settling of the microbes by gravitation, or the passing of it through certain filtering fabrics, then it may be just as pure and healthy as it was before it entered the diseased horse's lungs, that is, as far as glanders is concerned.

DISSEMINATION OF THE DISEASE.

The virus of glanders is usually spread through careless stable attendants; through public watering troughs; also by the matter of the discharge drying upon harness, blankets, and the like, for after it dries it is readily distributed by currents of air, and this dust, if exposed to a certain degree of heat and moisture, will grow and produce its characteristic effect upon susceptible animals with tolerable certainty, if it gets into the interior of their economy.

IN DEFINING THIS COMPLAINT

it may be said to be a malignant, contagious disease, due to the presence of a specific micro-organism, known as the *Bacillus mallei.*

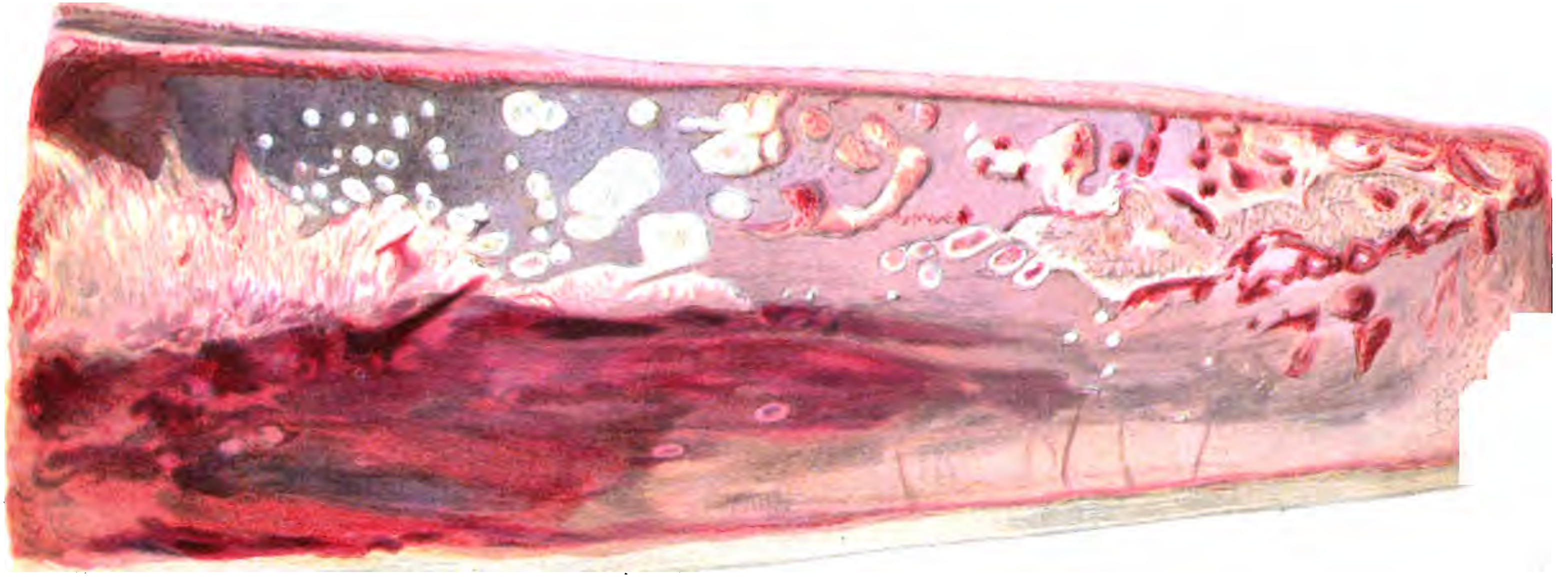
THE SYMPTOMS

of the disorder, seem easier to comprehend when they are described under four heads, viz.: chronic glanders, acute glanders, chronic farcy, and acute farcy, so that course will be pursued here.

Chronic glanders, being the variety oftenest met with, it seems natural to describe it first. This variety usually invades the animal in a somewhat insidious manner, appearing in the first place like a mild catarrhal affection, with a discharge from one or both nostrils, which is at first thin and watery in appearance, though it soon becomes thick and gluey, so much so that it will stick to the nostril, and cause it to appear smaller than in health. If glanders be present in a locality, these symptoms should cause one to be exceedingly careful, indeed any deviation from health should be regarded with suspicion during the prevalence of glanders. A few days

PLATE

UNIV



Haines del.

A Hoen & Co. Lithocaustic Baltimore

GLANDERS.

Nasal septum of horse, right side, showing acute lesions.

after the first symptoms manifest themselves, a swelling will make its appearance between the branches of the lower jaw, which becomes hard and tender, but seldom suppurates.

The animal is usually off its feed, and an acute observer will at once see that the creature is out of condition; some animals become unthrifty, their coat stares, the hair will have a tendency to drop out, especially that of the mane or tail, the legs have a puffed up appearance, and if the horse remains in the stable for a few days, the belly or some other dependent part becomes œdematous; a cough may, or may not, accompany these symptoms; finally the lining membrane of the nose presents one or more nodules, which soon break down, leaving the characteristic ulcers. (*See plate II.*) Often the ulcerated condition of the nostril in chronic glanders is very slight, and requires a rigid, careful examination to detect them. When the ulcers are confined to one nostril, we will generally find that the glands in the intermaxillary space, on that side, are the ones to become swollen, and frequently the eye on the same side will discharge a thick, sticky matter. One form of chronic glanders that we occasionally meet, and which gives rise to a great amount of trouble and expense, is called *spurious* or *pulmonary glanders.* This variety is exceedingly subtle in character, as it does not manifest itself by external symptoms; the discharge, tumefaction of intermaxillary glands, ulceration of the lining of the nose, all being absent, yet such an animal is capable of distributing the disease wherever it goes. There are many of these cases reported by writers upon the subject, one by Zundel being of such interest I shall repeat it here: A number of horses belonging to a miller were from time to time attacked with the disease in all its forms, and notwithstanding that most careful sanitary measures were adopted to eradicate it, yet it kept cropping out in a most unaccountable way, amongst his healthy horses every now and again; finally, through the consultation of veterinarians, an unhealthy-looking, thin horse, gave rise to suspicion. The owner happily consented to have this horse killed, and the *post mortem*, which was made, revealed various lesions of glanders in the lungs, there being caseous tubercles, indurated masses, and gelatinous deposits in many parts of them. In tracing up the history of this animal, it was learned that one of its former owners had died from a disease, which the attending physician called glanders and farcy.

Another form of glanders that often gives rise to most disastrous results is that in which an apparent recovery has been made, but the disease has only become insisted, to break out again in an unsuspected manner, and frequently with increased violence. Many cases of this nature have been brought under the writer's notice, one near Jackson, in this State, where four other horses on Mr. Brockway's farm were afterwards affected and destroyed on account of the malady. Chronic glanders occasionally assumes the acute form, and carries off the animal in a very short time. On the other hand, where animals suffering from chronic glanders have been permitted to live, they have done so for years, in some instances holding their condition fairly well, and doing considerable work.

ACUTE GLANDERS

manifests itself by much more evident symptoms than the chronic variety, the onset, course and termination, being of a very decided character. In many cases it acts as the closing scene of the chronic form, bringing a case that may have existed for years, to a very sudden termination. When the acute form comes on, as an independent disorder, it usually does so in the form of a *fever*, the pulse being materially quickened, running up to sixty or seventy per minute, the breathing becomes much accelerated, the afflicted animal's respirations often being as high as fifty per minute. The breathing is frequently performed with difficulty, even threatening suffocation. In most cases it is accompanied with a snoring sound, which is caused by the inflamed swollen mucous membrane blocking up the nasal chambers. Cases have been brought under our notice where it would appear that an exceedingly malignant attack had caused the snoring noise, by eating, through and through, the partition between the nostrils, the expired air passing through the aperature in a whistling, snoring manner.

In other instances, this form of the complaint comes on like a very severe cold, which may in a course of about forty-eight hours show unmistakable evidence of acute glanders, the lining membrane of the nostrils being eaten in every direction by angry looking ulcers, the temperature of the body running up to 106 and 107 Fahr., and remaining there for a day or two, when it may fall even below the normal. The horse shows great lassitude from the first, and cannot stand anything like severe exertion.

The voluntary muscles often tremble throughout their entire extent.

The discharge from the nostrils is frequently tinged with blood, and in all probability will be very profuse. When it is not tinged with blood, we often find it of a rusty hue; sometimes it has a most intolerable odor, but this is generally the result of decomposing bone. In former times, and even now, much reliance is placed in the specific gravity of the discharge by persons who have only partially investigated this disease, and those who profess to believe in the theory, tell us that if the discharge sinks in water it is the matter of glanders, but if it floats upon this fluid, it is the matter of a milder disease, but the matter coming from the noses of horses recently affected with "epizootic catarrhal fever" has been observed time and again, to sink suddenly to the bottom of the pail, from which the horse was drinking, while we have seen cases where the discharge from a glandered horse would float. No reliance can be placed in the specific gravity of the discharge.

Shortly after the first evidence of the disease, the intermaxillary glands become enlarged and painful to the touch, but seldom suppurate like the swollen glands of common *horse distemper*. If the tumor of glanders does happen to come to a head, and discharge, there seems to be a great difficulty for nature to heal the wound, and it becomes a chronic, running sore. Those who believe in the specific gravity of the pus theory, usually have another one, which refers, though, to the intermaxilliry tumors, and they say, that if the tumor adheres to the jaw bone it is a case of glanders, but if it can be moved about to some extent beneath the skin then the disease is not a dangerous one.

Experience has taught us that this theory is not to be relied upon, for we have often found both solid and loose tumors, in positive cases of glanders.

Animals suffering from acute glanders usually succumb to its ravages, in from one to two weeks, during which time they became rapidly emaciated, discharge large quantities of watery urine, and die most loathsome looking objects.

FARCY,

like glanders, is oftenest seen in the chronic form, and is characterized by indolent tumors called *fracy buds,* which vary considerably in the progress they make in different animals, and even in different parts of the same animal, but in most cases we find them of two varieties, that is, as far as the textures which are involved are concerned; some buds are confined entirely to the skin, several of them often forming a group, which, as the disease advances, coalesce, break, and discharge a sticky, amber-colored fluid, the angry-looking sore thus produced being very intractable with regard to the process of healing.

In the other variety, we find the tumor situated beneath the skin, imbedded in that substance which anatomists call cellular tissue, the structure which attaches the skin to parts underneath it. These tumors grow in some instances, from one-quarter to two inches in diameter, burst through and involve the skin, presenting most repulsive looking ulcers, which, when they first break, discharge a transparent, oily-like fluid, that in the course of time, is often replaced by an unhealthy, pus-like discharge. In many instances the chancres, as they are occasionally called, form in cords or chains, running for a distance of several feet along the surface of the body. They become more or less painful to touch, and are found in nearly every part, varying in number from one upwards. When they attack the legs, they frequently cause more or less swelling of the entire extremity.

These tumors often make their appearance somewhat suddenly, but usually develop in a successive manner, at first only one or two being noticed. Then, in the course of a short space of time, according to the severity of the attack, others form, and the number keeps increasing. We sometimes find them form and disappear again, to apparently break out in another place.

The time occupied for these buds to form and come to maturity, varies much with their position on the body. When superficial, involving only the skin, they may ripen and break in three or four days, but when they are deeper seated, they will probably take as many weeks, or even longer before they are ready to discharge their contents. During the progress of this form of the disease, lameness, which flies from one limb to another in a rather singular manner, will occasionally be noticed. In one case recently brought under our notice, the animal was found exceedingly lame in one hind leg when brought from the stable one morning; this being treated with soothing remedies disappeared in a day or two, to, however, reappear in the other leg in the course of about three days. It was again treated in a similar manner to the first outbreak, yielding in just as satisfactory and rapid a manner; but, singularly enough, inside of a week the animal was again reported lame; this time the right foreleg, though, was the one invaded, and the true nature of the disease was revealed on this occasion by more evident symptoms. According to the history which I have had from time to time while investigating this disorder, it is evident that a horse may not only live, but do tolerably well for even years although affected with chronic farcy; in this respect it resembles chronic glanders, with which it is frequently associated.

ACUTE FARCY

manifests itself in much the same general manner as the chronic form, but it is, so to speak, much more energetic in its nature, the onset, course, and termination, occupying but a few weeks, probably only a few days.

In it the body may literally be covered with tumors, presenting exuberant granulations that bleed upon the slightest provocation, a viscid, bloody, pus-like discharge oozes from them, and the affected creature becomes loathsome in the extreme. A year or two ago a horse was brought to us for examination, with angry-looking cancers extending from its head down both sides of its body to the hind feet, giving one the impression that they could be counted by the hundreds. The horse was hide-bound, tucked up in its flanks, its coat staring and dry; in all, the unfortunate creature was a sorry, dejected, loathsome spectacle, indeed, one could scarcely conceive a worse looking object; yet the owner, to use his own expression, stated that three weeks previous to the examination "it was as sleek as a new silk hat."

Several cases have been brought before us this year where this disease, accompanied with acute glanders, has reduced young and vigorous horses to a debilitated, dying condition in less than a week. One case more malignant than the others, was pronounced a case of acute catarrh by a competent veterinarian on a Wednesday; the next day his suspicions were aroused as to glanders; on Friday the symptoms were well marked. I saw it on the following Tuesday, when it was far gone with both glanders and farcy; the buds of the latter seemed to cover the whole body, while the microbes of the former literally devoured the *septum nasi* (partition between the nostrils). The unfortunate creature looked ready to die at any moment. It was destroyed the same afternoon. The disease in this case advanced with more rapidity and malignancy than in any other instance yet brought under our notice.

THE POST MORTEM

appearances of glanders possess much interest, showing in many instances that the disease is not confined entirely to the respiratory system, but the digestive organs, notably the liver and spleen, come in for their share of the work of the destroying microbe; the kidneys and some parts of the generative system, seem to be suitable spots for the poison to develop in. The disease may be recognized in these parts by the presence of nodules, varying in size from a millet seed upwards. In some instances being merely hard indurated masses, in others they appear to be of a caseous, or cheesy nature, while a third variety will be found to contain pus.

The mucuous membrane of the air chambers will often be found ulcerated, far beyond detection in the ante-mortem state. There seems to be little relation, if any, between the external and internal manifestations of the disease. Sometimes when it is scarcely recognizable on ante-mortem examination, it is well developed internally, and *vice versa.*

The resemblance of this disease to tuberculosis, of the human family, is so well marked, that even in recent times they were regarded as the same complaint by some eminent scientists, but while it is now definitely proved that they are two distinct disorders, yet it takes the most accurate and careful bacteriological observation, to distinguish the bacillus of one dis-

PLATE No. I

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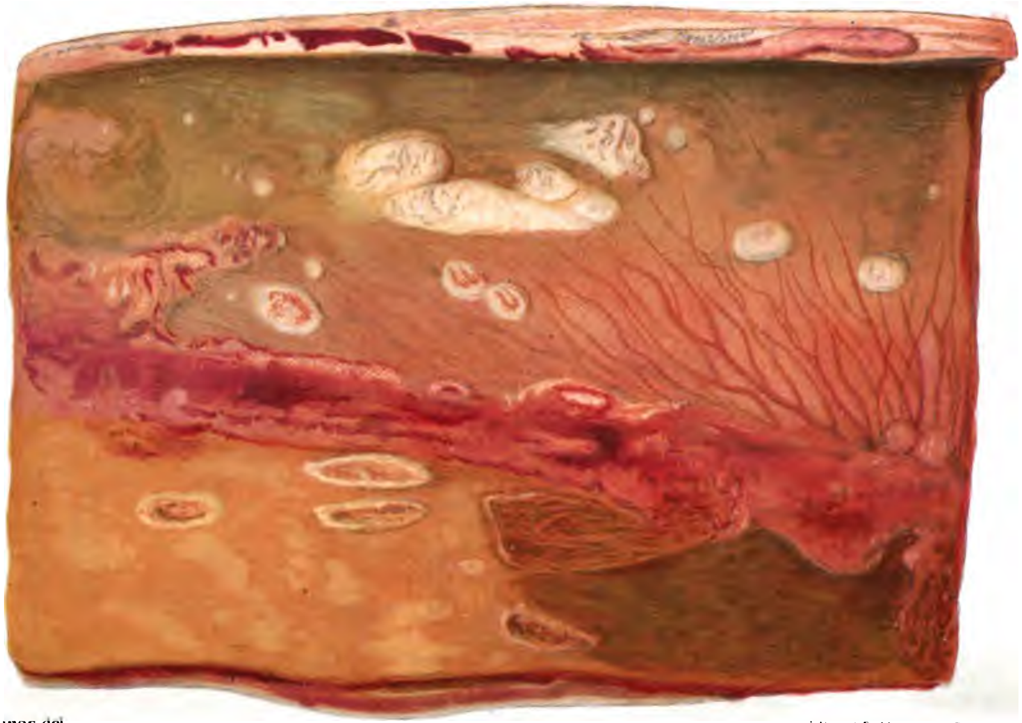

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GLANDERS.

Middle region of nasal septum, left side, showing ulcers.

order, from that of the other, and the nodular appearances which they both produce, in the parts they invade are most strikingly alike.

Glanders is said to be communicable from the horse to most other animals, notably sheep, goats, dogs, cats, rabbits, and guinea pigs. Horned cattle are said to possess immunity from this disease, and some doubt the susceptibility of hogs.

When it is determined to test the virulence of a certain discharge from a suspected case, at least three animals should be inoculated, if more, all the better, and a liberal dose of the material should be inserted, guinea pigs making suitable and convenient animals to perform the operation upon. This operation should only be undertaken by those who thoroughly appreciate the chances of the spread of such a disease through careless manipulation.

MORTALITY OF GLANDERS.

A large percentage of animals affected with this disease succumb to its influence, though it has been estimated that about five per cent recover, even if left without treatment. It is not, however, the death rate alone, which makes this a disease so much to be dreaded, but it is the chance of oneself becoming affected, and that with one of the most loathsome diseases known to mankind, that should cause us to regard the general treatment of it with disdain, and urge us to destroy affected animals at once. Taking this view of it, it may be unnecessary to describe specific lines of treatment here. Dead animals should be cremated.

THE HANDLING OF SUSPECTED

animals is a question that may, perhaps, be profitably noticed, and the first thing that should be done, is to place them in isolated quarters, taking care that all stable utensils, pails, etc., that are used for them, are not used for other animals; the harness that they have worn should be disinfected; it may be placed in a barrel or close box, in which a few ounces of sulphur should be burned. When it is practicable to disinfect the stalls which have had glandered horses in them, with the fumes of sulphur, a good way is to place it in a sound iron pot, which should be elevated on, say a few bricks; then set fire to the sulphur with good live coals. The building should be closed, all animals having first been removed, and the fumigation kept up for about twenty-four hours. The amount of sulphur required for thorough disinfection is estimated at 3 lbs. for every 1,000 cubic feet, in other words a space 10 feet square. If the compartment to be disinfected is a large one, several pots may be used, being safer and more convenient, if not more effectual.

When it is not convenient to disinfect the stable with sulphur, the thorough washing of all contaminated parts, mangers, etc., that have been bespattered with the discharges, with sulphate of iron (copperas makes a fair substitute), allowing about one pound to a gallon of water. In those cases where the mangers, etc., are of little value, they should be burned.

GLANDERS IN MAN

seems to behave itself in about the same general way that it does in the horse, though as far as I have been able to learn, it is oftener found in the acute form. The percentage of deaths is very large. In Quain's dictionary of medicine we are informed that 208 cases out of 245 terminated fatally; further than that, it sometimes spreads with considerable rapidity in a household. Dr. W. T. Councilman, professor of pathological anatomy at Johns Hopkins University, tells us, in Buck's Hand Book of Medical Sciences, that a man, his wife and four children became successively infected, the disease starting in the man. Further the same author says: "In making the diagnosis the first thing to be considered is the occupation of the patient. In ninety-five per cent of all cases the patients have been engaged in the care of infected horses."

Again, we have trans-atlantic authors writing in the same strain, for we find Arthur E. Durham, surgeon at Guy Hospital, London, in Quain's dictionary of medicine, saying under the head of diagnosis: "The diagnosis of glanders in man may be difficult in the early stage, particularly if the history be defective and no external wounds appear. But when the disease is fully developed the signs and symptoms, especially if taken in conjunction with the *occupation* and *history* of the sufferer, are sufficiently characteristic. In some rare instances, however, in which the constitutional symptoms have been slight and the local manifestations have very slowly developed themselves, great difficulty has arisen, and the true nature of the disease has not even been recognized until after death. *Rheumatism*, *typhoid fever* and *pyœmia*, and, in regard to the more chronic cases, *syphilis* and *tubercolosis* are the diseases with which it is said glanders may be confounded."

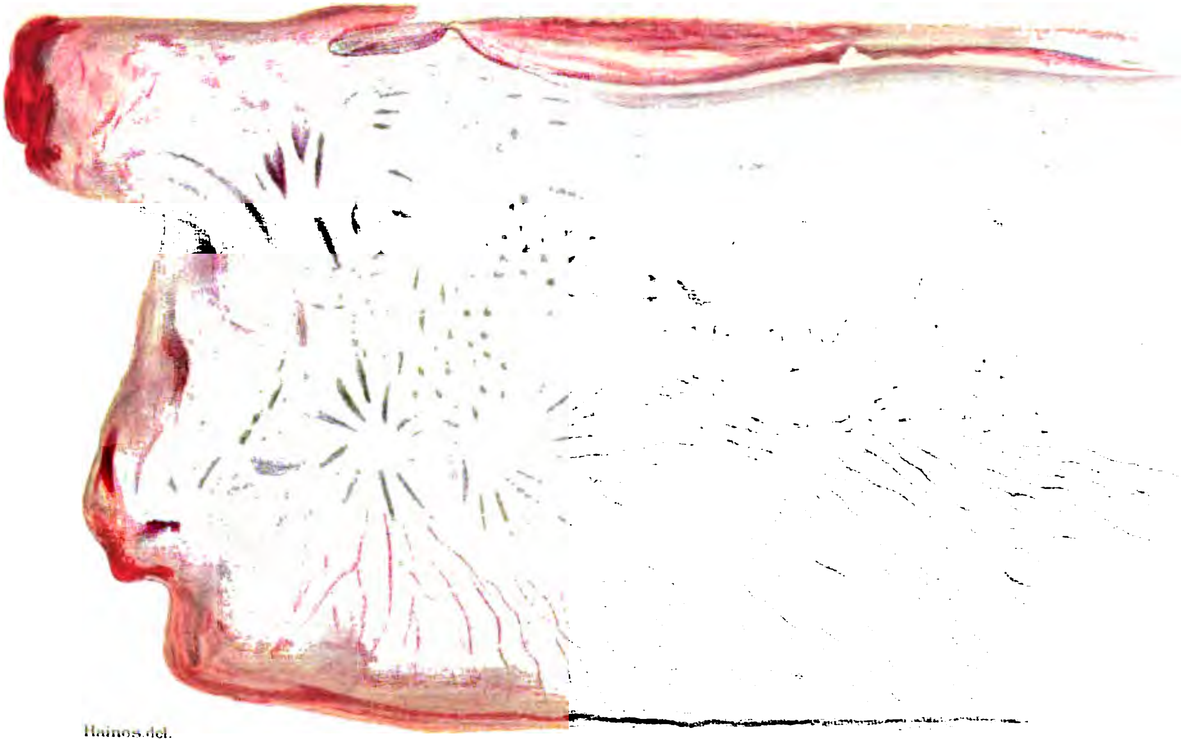
So it becomes at once apparent from the foregoing, that glanders may be a more common disease in the human family than is generally supposed. I have known of several cases in this State where persons have died, presumably from some other disease, though the history and occupation pointed to glanders. In the northern peninsula I found seven hores in one stable affected with glanders. On asking for the man that owned them I was told that he had died about two weeks before from an attack of *inflammatory rheumatism*, and that among other things there was a running sore from one knee. If this was not a pure case of glanders in the farcy form it looked very like. Another case was brought under my notice last fall in the northern part of the State which possesses some interest from a pathological point of view. I examined a horse belonging to a farmer, and pronounced it a case of glanders. It happened that the man I obtained the livery from to go to the farm was an undertaker and had attended as funeral director in the case of the farmer. On learning my opinion with regard to the horse, he described the appearance of the man, which was loathsome in the extreme, and asked me if I thought it could be glanders? Surely it was! although it had been regarded as erysipelas. The man had been attending the horse, and had a sore on the side of his nose from which the disease seemed to start.

In cases like the above it would appear that it is only through the aid of bacteriological investigation that the true nature of some outbreaks can be determined.

SYMPTOMS IN THE HUMAN FAMILY.

As has been said before, the same general symptoms present themselves as in the horse, though there are many which, although they may be present, are not recognizable by the veterinarian and others which no doubt pass unnoticed. The time for the disease to manifiest itself after exposure

PLATE No. II



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GLANDERS.

Posterior half of nasal septum, right side, showing cicatrices.

varies from two or three days, to several weeks, when the patient, according to Durham, will have a general sense of discomfort, fatigue, prostration, and chilliness, with headache, and obscure pains in the muscles and joints. As the disease advances these pains become more severe and simulate those of rheumatism. The pulse is quickened and sometimes full, the skin hot and dry, the tongue foul, the urine scanty and high colored, and the patient suffers much from restlessness, sleeplessness, and loss of appetite, often with obstinate constipation. Sometimes the fever is intermittent, but more frequently continued, or intermittent at very irregular intervals. Still later rigors occur, more severe than such as may have occurred at an earlier period, followed by profuse sour perspiration and clamminess of the skin. The pulse becomes very rapid, weak, and compressible. Diarrhœa with very fœtid stools succeeds the constipation; the thirst is excessive; respiration becomes more and more difficult and labored; low delirium with tremors is followed by coma, and death ensues from exhaustion. In the acute form, the disease runs its course in an average period of about sixteen days. Some cases have terminated fatally within a week, others have been prolonged for four weeks. In the less acute form, the duration may be from six weeks to two months, and in the most chronic form, in which all the symptoms are less severe, the duration may extend over several months, and in some cases recovery ultimately takes place.

IN THE HUMAN FAMILY,

this disease is usually treated with those remedies which are calculated to overcome the poisonous properties of such diseases, such as quinine, iodine, and its compounds; the compounds of iron or copper are all good. Of course, good nursing and cleanliness will do much in bringing about a favorable termination. The disease in man sometimes takes a favorable turn to break out again with often increased violence, just as it does in the horse. The following case reported by Councilman shows how it behaves in this respect. In May some of the nasal secretion of an infected horse was injected into the face of a stable attendant; shortly after this the glands of the neck became swollen, and abscesses appeared at various places over the body. In June he had chills, followed by fever, with excessive inflammation of the glands of the neck, and in August abscesses in the legs. In September these abscesses were as large as goose eggs and healed completely on being opened. The patient became convalescent. This lasted until January, when boils broke out on the left forearm. In February there was a purulent discharge from the nose. In March pleuritic pains and difficulty of respiration, with cough, a large phlegmonous swelling developed on the cheek, stupor followed, and the man died April 12th. The autopsy showed extensive ulceration in the nasal cavities, and other characteristic lesions in the lungs, skin, muscles, etc.

The period of incubation of glanders seems to be about the same in all animals, varying from a few days to several weeks or even months.

In examining a horse for glanders, one of the most important parts to be inspected is the interior of the nasal chambers, for here we usually find well marked lesions of the disease, but before doing so, we should endeavor to make ourselves familiar with the healthy appearance of these cavities, this is perhaps best done by looking carefully into the chambers of several healthy horses and observing their appearance. To do this the head should be placed in that position which enables a ray of sunlight to pass into all visible parts of the chamber. The opening of the nostril may be dilated with the fingers, which method has proved more satisfactory in the writer's hands than any artificial device for examining such cavities yet brought under our notice. Examine first one chamber, then the other. The operator must not expect to see very far back into the cavity, owing to the peculiar anatomical conformation of it. When healthy we will find the mucous membrane, or lining of these cavities smooth, moist, and of a rose pink color, such as may be seen for about an inch on the extreme right of figure on plate No. III.; any very marked deviation from this is indicative of disease or distress. In typical cases of glanders the membrane presents a peculiar metallic purplish blue, or leaden hue, similar to the ground work on the upper part of figure, plate No. I. Besides taking cognizance of the color, we should pay close attention to any deviation from the normal, smooth condition of the membrane.

In some cases, and usually in the early stage of the disease the membrane appears as if little circular pits, with sharply defined borders had been cut out of it with a miniature wad cutter; similar to that group of twenty, more or less, seen on the left of the upper part of figure, plate No. I.

In the course of time the circular spots become confluent, and one or more of them run together, forming ulcers, which resemble the irregularly oval spots on the upper and lower halves of the figure on plate No. II., these occasionally heal, leaving star shaped cicatrices (seamed scars), as exhibited on the left half of figure on plate III.

On the other hand the ulcers represented in the figure on plate II, often assume a much more formidable aspect, becoming ragged sores, having a tendency to consume the surrounding tissues, in a cancerous manner, well illustrated by the angry appearance on the right half of the figure on plate I., burrowing so deep in some in instances as to cause a hole through and through the *septum nasi* (partition between the chambers). The deep red surface on the lower left half of figure, plate I., represents inflamed mucous membrane, the result of irritation caused by the disease, as is also the red tract running somewhat obliquely through the center of the figure on plate II. We often find a pus-like discharge from such ulcers as are represented in this plate.

Modifications of the disease as represented in these plates will be found described in another part of this bulletin under the head of symptoms. In examining the nasal chamber of a horse suspected of glanders, it may be well to use a short stick instead of the fingers in dilating the nostril, say a piece of shingle eight inches long and one inch wide; a twitch on the nose of a nervous horse will usually keep the head steady.

E. A. A. GRANGE,
Veterinarian.

AGRICULTURAL COLLEGE, MICH.,
December, 1891.

While questions of public health are delegated to another board by the statutes of our State, we deem it but proper to add that in the pursuit of our duty in trying to extirpate glanders from the domestic animals of our commonwealth, we every year come upon unmistakable evidence of death among the human family from this loathsome disease.

ANTHRAX.

Occasionally, sporadic cases of anthrax among horses and other domestic animals are brought to our attention; but in no case has a general or serious outbreak of this very dangerous and fatal malady occurred in this State since the organization of this commission.

EQUINE TUBERCULOSIS.

Tuberculosis in its development as consumption of the lungs, has been unknown to to this commission among horses, until the present year, when a typical case was brought to our attention and a post mortem fully established the fact.

PURPURA HŒMORRHAGICA.

This disease occasionally appears among our horse stock, and in accute cases is often diagnosed as farcy or glanders. It is not considered by scientists as communicable. Attention is here called to the statements of our State Veterinarian, relating to this disease, which accompanies this report.

DISEASE OF CATTLE.

ACTINOMYCOSIS.

Actinomycosis or lumpy jaw was apparently epizoötic in several townships in this State at the date of our last report and was engaging a good deal of our attention, and causing considerable loss to cattle growers in some localities. The disease appeared in a sporadic manner, but spread, in some localities, with considerable rapidity. A series of experiments were then in progress at the experiment station under the solicitation of this Commission, to learn more about the communicability of the disease. But little was learned from the experiments. In fact, it may be said that the results were negative. It may now, however, be stated, as a pleasant fact, that the disease in this State seemed to have rapidly run its course and ceased its depredations as mysteriously as it came, and it may be considered as not present now with us. While the foregoing may fairly be treated as the chapter embodying the recent history of this disease with us, we are able to herewith promulgate very important information relating to its successful treatment elsewhere. The bureau of animal industry under direction of the secretary of agriculture, and in behalf of the general government, have been carrying on very extensive experiments during the last year, principally at Chicago, for its cure. The manner and mode of treatment are fully set forth in bulletin No. 2, U. S. department of agriculture, bureau of animal industry, from which we quote.

Treatment:—" The medicine used by the bureau of animal industry in the treatment of actinomycosis or lumpy jaw is the iodide of potassium. The dose should never exceed one-quarter dram for every one hundred pounds live weight. The proper dose being from two to three drams according to the size of the animal and the extent of the disease. This dose may be given once a day for from five to six days, when the animal may show slight symptoms or iodism, viz.: Discharge of thick mucus from the nose, and flowing of tears. The animal will become constipated perhaps, but this may be easily remedied by giving a dose of glauber salts, and some bran mash. This will restore the appetite, and two days after the last dose was given, the animal will be ready for another week's treatment, and so on until a cure may be effected. If these precautions are taken, no ill effect will result from the treatment, and if properly fed the animal will gain in condition uninfluenced by the medicine. There is however, a great difference as to the effect of the medicine on different animals, but any farmer who takes an interest in seeing his stock do well, will easily perceive when it is best for him to stop and give the animal a rest for two or three days. The medicine is best given dissolved in soft water, and given by means of a horn or long necked bottle. One dose of the medicine, say one and one-half to two or three drams as the case may seem to require, is dissolved in about a pint of water, seize the animal by the nose to hold up the head, and the contents of the bottle is emptied into the mouth without fixing or securing the tongue in any way."

The medicine is not expensive and can be procured at any drug store, and if the farmer has not suitable scales it can be put up in desired doses by the druggist.

A large per cent of the cases treated with this remedy have been reported cured, and the treatment is well worthy of a trial.

Our observation, with the many cattle we have had under our charge in this State, leads us to conclude that many cases may be cured in the early stage of development by the use of the knife.

CONTAGIOUS PLEURO-PNEUMONIA.

This, the most disastrous of all cattle diseases, is an exotic disease, imported to this country nearly a half a century ago and safely housed in the dairy stables of our Atlantic seaboard. It had gradually crept inward, so that in 1886 it was found camped in the vast distillary stables of Chicago. It has finally been stamped out on this continent by persistent and energetic work of the department of agriculture, but not until more than a million dollars had been expended by the general government and the different states in the great undertaking. The official promulgation of this fact is as follows:

PROCLAMATION.

ERADICATION OF PLEURO-PNEUMONIA.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

To all who it may concern:

NOTICE IS HEREBY GIVEN, that the quarantine heretofore existing in the counties of Kings and Queens, state of New York, and the counties of Essex and Hudson, state of New Jersey, for the suppression of contagious pleuro-pneumonia among cattle, are this day removed.

The removal of the aforesaid quarantines completes the dissolving of all quarantines established by this department in the several sections of the United States for the suppression of the above named disease.

No case of this disease has occurred in the state of Illinois since December 29, 1887, a period of more than four years and eight months.

No case has occurred in the state of Pennsylvania since September 29, 1888, a period of four years within a few days.

No case has occurred in the state of Maryland since September 18, 1889, a period of three years.

No case has occurred in the state of New York since April 30, 1891, a period of more than one year and four months.

No case has occurred in the state of New Jersey since March 25, 1892, of a period of six months, and no case has occurred in any other portion of the United States within the past five years.

I do therefore hereby officially declare that the United States is free from the disease known as contagious pleuro-pneumonia.

Done at the City of Washington, D. C.,
this 26 day of September, A. D. 1892.

J. M. RUSK,
Secretary.

TUBERCULOSIS.

In a former report we said in referring to tuberculosis among cattle:

"Undoubtedly this disease has gained a serious foothold in our State, and is causing large losses among our cattle stock. It is beyond question both infectious and contagious, particularly in the pulmonary development or consumption of the lungs. The commonly accepted theory is that it is communicable to man, not only by direct contact, but also in the partaking of the milk and meat of these diseased animals."

Years of added experience and careful observation lead us to the conclusion that the annual losses among Michigan cattle from tuberculosis is much greater than from all the other contagious diseases affecting our domestic animals and that the disease is steadily increasing. We have given the subject very careful thought and consideration, and have as yet failed to find a satisfactory plan for its treatment or extermination. The scientists have furnished no prescription for its cure, and history does not abound with feasable plans for its successful stamping out in a great State. It, as yet, is one of the unsolved problems, lying all in front and like some bridges, in our pathway, the day is not far distant when an attempt must be made to cross.

TEXAS FEVER.

The files and records of this commission, for the year 1886, show, that from the official reports of the police and health officers of Detroit to the commission during the summer of 1885 (the year this commission was organized), that more than ten thousand dollars worth of cows perished in that city alone from Texas fever. The most of them were the property of poor people. In addition to this, losses from this peculiar disease were occurring at other cities in the State. From and including the year 1886 (the law not taking effect until late in 1885), this commission has been striving to regulate the handling of the thousands of Texas cattle slaughtered in Michigan, so as to reduce the loss of native cattle from Texas fever to the minimum, with the result that during the year 1892 not a single case of Texas fever was reported in the State. It may be inferred that the traffic in this class of contagion carrying cattle has practically ceased, but such an impression would be far from the fact, for during the months of July, August, September, and October of this year, there were received and slaughtered at Detroit, 11,401 head of Texas cattle. The general government, during the last three years has adopted the same regulations as to branding cars and yards, and isolating Texas cattle from natives, as was originally provided in our Michigan laws, and by the rigid inspection of all cattle at principal distributing points, and requiring transportation companies to keep these cattle in branded cars and yards, and thereby always identified, it has very materially aided this commission in carrying out its regulations in this State.

For the two years covered by this report this commission has operated in dealing with so called Texas cattle under the following rules and executive proclamation, being substantially the same for both years only differing in dates.

PROCLAMATION.

EXECUTIVE OFFICE,
MICHIGAN.

WHEREAS, By act No. 182 of the Session Laws of 1885, it is made the duty of the Governor in certain cases to issue a proclamation relating to certain quarantine regulations as prescribed by the State Live Stock Sanitary Commission to prevent the introduction or spread of any contagious or infectious diseases among the domestic animals of this State;

WHEREAS, The State Live Stock Sanitary Commission did, on the 5th day of May, adopt the following rules and regulations governing the importing, handling and yarding of so called Texas cattle for the season of 1892, viz.:

RULES AND REGULATIONS OF THE MICHIGAN LIVE STOCK SANITARY COMMISSION RELATING TO THE IMPORTATION AND HANDLING OF SO CALLED TEXAS CATTLE FOR THE YEAR 1892.

It is hereby ordered by the Live Stock Sanitary Commission of the State of Michigan, that the importation of so called Texas cattle, or cattled raised south of the 36th parallel of north latitude, and that have not been kept continuously at least one winter north of said parallel, be strictly forbidden and prohibited until the first day of November next, except such of said cattle as are in transit across this State, and they shall only be unloaded in this State for the necessary time and purpose of feeding and watering, and then only in the Texas division of what is known as the M. C. stock yards, in the township of Springwells, Wayne county, better known as West Detroit, and which shall be kept plainly lettered, "For the yarding of Texas cattle only," and to which division of the aforesaid yards no other class of cattle shall be admitted. Nor will this class of cattle be permitted to be handled by dealers or others in any other cattle yards of the State, except at the Texas division of the M. C. stock yards as before cited; and excepting, also, such of the above cited and so called Texas cattle as are intended for immediate slaughter, and these so called butchers' beasts shall be unloaded only at the slaughter house or killing dock, where they shall be held in strict quarantine until slaughtered, and in no case will they be permitted to be driven or handled upon any street, highway, alley, lane or common whereby the health of any of our northern or native cattle may thereby be endangered, nor in any case will they be allowed to be pastured within the limits of this State.

The commission takes this occasion to warn and caution importers and slaughterers, and all other persons who may desire to engage in this traffic, of the great danger to our cattle stock of importing Texas or splenic fever and conveying same to our native cattle, and to inform them that the importing and killing of these southern cattle, even at the unloading shute, may be attended with danger to our native cattle, and that these regulations will in no way relieve the personal responsibility for damage of any party engaged in the traffic that may result to our northern cattle from his acts under these regulations and the provisions of law under the operations of which the same are made and promulgated.

The commission also again calls the attention of all railroads and transportation companies doing business in this State to the provisions of Act No. 198, Laws of 1885, entitled "An Act to regulate and provide for the carrying, yarding, and feeding of so called Texas cattle while in transit into or across this State between the first day of April and the first day of November of each year."

H. H. HINDS,
J. J. WOODMAN,
J. E. BARRINGER,
Members of the Michigan Live Stock Sanitary Commission.

Detroit, May 5, 1892.

Now, therefore, I, Edwin B. Winans, Governor of the State of Michigan, in pursuance of the statute in such case made and provided, and by virtue of the authority vested in me by law, do hereby proclaim and publish the above cited rules and regulations to be in full force and effect, and I hereby call the attention of all shippers and dealers in live stock, transportation companies, managers of stock yards, and all other parties interested, to the manifestly proper and fair rules and regulations of the State Live Stock Sanitary Commission, heretofore recited, relating to the subject and to the laws under which the same are made and promulgated.

[L. S.] IN TESTIMONY WHEREOF, I have hereunto set my hand and caused the great seal of the State to be affixed this thirteenth day of May, A. D., 1892.

EDWIN B. WINANS,
Governor.

By the Governor:
ROBERT R. BLACKER.
Secretary of State.

This general plan of handling so called Texas cattle has caused but little trouble and required but little attention outside of Detroit and there it seems to work fairly satisfactory at the Michigan Central stock yards, but the hour has undoubtedly now arrived when much greater loss than profit will ensue if the traffic is farther continued at Kings' stock yards on account of the impracticability, if not impossibility of keeping the prescribed cattle fully isolated until reshipment or slaughter.

DISEASES OF SHEEP.

SCAB.

The general situation, in relation to the parasitical skin disease known as scab, which is so greatly dreaded in all extensive wool growing sections, and countries where sheep are herded in large bands or flocks, remains substantially the same as when we discussed this matter in our last biennial report. We therefore reproduce from that report the following on that subject:

Complaint has been made to the commission, that western sheep afflicted with scab are annually imported into this State and fed during the fall and winter months and reshipped to market. As the disease can be subdued by thorough treatment, the action taken upon the cases reported has been to require perfect isolation from all other sheep during treatment, care in driving upon the public highways and thoroughly disinfecting all stables, pens and yards where they have been kept. It is evident, however, that there is a growing apprehension among the flock-owners of the State, that these importations of diseased sheep may result in great damage to the well-earned reputation of our Michigan flocks, if not in spreading disease among them; and yet to prohibit the importation of sheep for feeding purposes, would be a heavy blow to an important agricultural industry of our State and should be well considered by all engaged in sheep-husbandry, and the nature of the disease thoroughly studied and well understood before demanding full prohibitory measures.

The following from the report of Dr. D. E. Salmon, chief of the National Bureau of Animal Industry, will be interesting in this connection:

"Of all the diseases of sheep in this country, scab is the worst feared by the flock-master. So insidious in its attack, so rapid its course, so destructive its effects, and so difficult is it to exterminate that it has justly earned the distinction of being more injurious than any other disease caused by external parasites. Scab alone, of the parasitic diseases, has become the subject of legislation in most countries; and yet, if proper precautions were taken and a radical treatment followed, this disease could soon be completely eradicated."

The disease is caused by an insect known as scab-mite, or itch insect (*Psoroptes*) and communicated by the affected animals coming in contact with each other, rubbing against posts, fences, etc., and dropping tags of wool by the wayside. Upon the length of time the insect will live after being separated from the sheep, authorities seem to differ. Dr. Salmon says:

"Experiments show that they can live on a piece of scab at a moderate temperature from ten to twelve days, and about sheep pens and yards from twelve to fifteen days, and after being subjected to intense cold;" while the authors of the American cyclopedia of live stock, says: "The insect is so tenacious of life that it has been said to have remained in a pasture three years and then spread the infection."

Treatment: To effectually cure the disease every sheep in the affected flock should be immersed in a liquid solution to kill the insect, the stables, pens, and yards should be thoroughly disinfected, and the dipping repeated in six or seven days. Hence it will be seen, that to eradicate the disease from a large flock of sheep requires much labor, great care, and considereble expense; and it is but reasonable to infer that the work is seldom done thorough enough to effect a permanent cure. If importations from infected districts are to continue, it may become necessary to provide a system for inspecting the sheep before they enter the State or enforce such quarantine and other sanitary measures as may be deemed necessary to protect our native flocks from the infection.

INTERNAL PARASITES.

The growing lamb crop of 1892 has been very seriously damaged in this and neighboring states, by intestinal parasites known scientifically as strongylus contortus. These pests are so new to us, the cause of their appearance almost simultaneously in various parts of the State, that, without further discussion, we call attention to the State Veterinarians' treatise on this subject, accompanying this report.

Our attention is frequently called, during the feeding season, to extensive and sudden deaths among fattening sheep or lambs on a single farm, or perhaps three or four neighboring establishments. From the reports the impression obtained would be that a contagious disease of a malignant character was desseminating the flock or flocks reported. An investigation is made, post mortem held and the facts develop that death was due to faulty digestion, congestion of the lungs, suffusion, or other acute local trouble. Usually the subjects are among the larger and robust specimens of the flock. A careful survey of the surroundings usually leads to the discovery that the store lambs and breeding sheep of the farm are not being attacked by the malady. An examination of the environments of the fattening and breeding flocks shows that the fattening flocks are in inclosures so closely housed that the drinking water seldom freezes, while the breeding flocks are simply protected from the storm overhead and from the blasts of the blizzard. Perfectly open and free ventilation everywhere, with the temperature running as low as zero at times. The lessons of the occasion are apparently plain. Sheep need to be fed and herded only in the manner that most nearly approaches nature. Nature furnishes their raiment. They should be protected from the storm and wind. Close housing leads to sanitary conditions fatal to the flock. The barn becomes a breeding pen for pestilence and disease. In fact, a pest house. The reason that several flocks in the same vicinity are similarly affected, comes from the fact that each feeder is trying to excel his neighbor in the perfection of his feeding plant, and in his attempts to have the best and most desirable sheep barn, actually kills his valuable stock with mistaken kindness.

DISEASES OF SWINE.

SWINE PLAGUE OR HOG CHOLERA.

During the year 1891, the losses in Michigan from Hog Cholera were quite extensive and covered a rather wide area from which occasional outbreaks were reported. Very much less loss however from this fatal swine plague has been reported during 1892. The State itself has been again a very great loser from this cause, during the last year, in the destruction of the extensive herd at the Northern Insane Asylum at Traverse City. There is not great danger of an infectious disease like this spreading with very great rapidity in this State, as swine, as a rule, are raised on fenced farms and within enclosures, and the swine of one farm are therefore almost as much isolated from those of another, as though all were in quarantine. Scientists have not, as yet, apparently found any effective specifics, either to prevent or cure this malady. As this commission has practically added nothing to its stock of wisdom relating to this malady during the last biennial period, we therefore copy the following extract from our report of two years ago:

* * * "The disease is very contagious, rapid in its work and generally fatal in its results. It is caused by a specific microbe multiplying in the body of the diseased animal. It belongs to the *germs bacterium*, and has the power of spontaneous movement. It is so tenacious of life that it will live in water, and in a dried condition for an indefinite period, and be carried from field to field, and from farm to farm, by water courses, flesh devouring animals, birds and insects, if not floated in the atmosphere; and when taken into the stomach of the swine, in food or drink or inhaled into the lungs, or injected into the circulation by flies and gnats, will incubate and produce the disease. There is but little doubt, but what the disease may be produced spontaneously by filthy environments, and when once started in a locality, the means for accelerating its spread are so numerous, imperceptible, and consequently uncontrollable, that no one can tell what the limit of the contagion will be, or where its destructive work will end.

Treatment: It is generally conceded that the cheapest and most effective remedy for the disease, is to kill and burn or deeply bury the affected animal as soon as the symptoms of the disease develop; and the most effective means to prevent its spread, is to enforce close quarantine of every affected herd, separate the sick from the well, preserve cleanliness in all the surroundings, and thoroughly disinfect all pens and yards where the diseased animals have been kept.

The Commission will spare no effort to obtain all of the available information relating to the nature, treatment, and preventives of this disease which is possible, and give the same to the public as occasions may require but at present, cannot with confidence, recommend any specific for the disease, nor preventives further than to enforce rigid sanitary measures."

The term of office of John McKay, of Romeo, expired by limitation on the second Tuesday in July, 1891, and Mr. J. E. Barringer, of Armada, was appointed his successor for the statutory term of six years from the above date.

The term of office of Prof. E. A. A. Grange, State Veterinarian, expired by law limit on the second Tuesday of July, 1891, but as no successor has been appointed to that office, Prof. Grange is still acting as State Veterinarian under the operation of the same law. The report of that officer is herewith attached and careful attention is called to its details and statements.

H. H. HINDS,
J. J. WOODMAN,
J. E. BARRINGER,
The State Live Stock Sanitary Commission.

LANSING, MICHIGAN,
March 20, 1893.

REPORT OF THE STATE VETERINARIAN.

Lansing, January 2, 1893.

HON. H. H. HINDS, *President State Live Stock Sanitary Commission:*

SIR—Since submitting my last report to you, I have been called to many parts of the State for the purpose of investigating reported outbreaks of contagious disease, and as in previous years, a very large majority of these outbreaks proved upon examination to be glanders amongst horses, though other communicable diseases have from time to time made their appearance, but considering the vast number of domestic animals there are here, surely the live stock owners of this commonwealth are to be congratulated upon the extremely small percentage of animals that have been reported as affected with contagious disease.

Amongst horses I have been brought in contact with another disease besides glanders which has created more or less anxiety in the locality from which it was reported until its peculiarities were explained. This being, as far as I can learn, a new disease in most parts of the State, a brief description of some of its more salient features may not be out of place here, for it is often mistaken for glanders or some other malignant contagious disease. The malady is called purpura-hæmorrhagica, probably from the fact that purple spots of effused blood make their appearance on various parts of the body, or lining membranes of such cavities as the nostrils, the mouth, inside of the eyelids, as well as upon other mucous surfaces.

THE CAUSE

of this complaint is wrapped in much obscurity. It is generally thought to occur as a sequel to some debilitating disease, catarrhal fever, distemper and the like. Again it is thought in many instances to be the result of ill ventilation, bad drainage, etc. Stables located near beds of rivers or other low lying regions are thought to be favorable localities for animals to be invaded with the complaint. While the above causes may, and no doubt do have an indirect influence in the production of this complaint in an animal, yet so many cases have been brought under our notice where the sanitary surroundings were all that could be desired, that we believe this disease will have to be investigated from a bacteriological standpoint before the true nature or cause of it will be discovered.

The symptoms of the disorder vary somewhat with individual outbreaks. In many instances it comes on suddenly, when an animal will in a few days be reduced to a loathsome looking object, having large pieces of flesh preparing to slough off from various parts of the body, and in the course of a week a surface as large as a man's hand, more or less, will be found denuded of skin. In other cases swelling appears in various dependent parts, the legs, lower parts of the body, eye lids, lips, edges of the nostrils, etc. The inside of the nose, lining membrane of the nostrils, will be found with numerous red or purple spots upon it. This appearance is often mistaken for glanders by those who are not familiar with the two diseases. Animals often run down in condition and become much debilitated; refusing to eat, they become very dull and pulseless, the surface of the body gets cold, and things go from bad to worse until death finally relieves the affected creature from further suffering. While in other cases decided improvement will be noticed in the animal's general condition in four or five days if judicious remedies and good nursing are adopted.

In rare instances the disease attacks the internal organs of the animals, giving rise to serious complications causing the death of the patient when least expected.

TREATMENT.

When this is undertaken much stress should be laid upon the sanitary surroundings and the animal removed from all offensive smells, bad drainage and ill ventilation. The swollen parts should be gently bathed and a weak solution of tincture of iron, say one part of tincture of iron and fifty parts of rain water, sponged over the part after bathing. Some judgment must be exercised with regard to moving the animal. In some I have noticed that gentle exercise seemed to promote a favorable termination to the attack, while occasionally it appears to do more harm than good, especially in the acute stage of the disorder. The medical or constitutional treatment should be in the hands of a competent veterinarian, as it is often advisable to change after using certain remedies for some days, especially if the case is not progressing in a satisfactory manner. It must be borne in mind that animals, like man, possess idiosyncrasy as far as the action of medicine is concerned. In the writer's hands, turpentine, tincture of iron, and chlorate of potassium, in properly regulated doses, have all proved valuable in overcoming the symptoms of the malady. The action of the bowels should be encouraged by laxative food and in some cases with a little oil.

EQUINE TUBERCULOSIS

is a disease of exceedingly rare occurrence as far as my experience has gone, and I do not find that it has been often recognized by others. During the past eight years while acting as State Veterinarian only one case has been brought under my notice, though I have had considerable experience with it in some other animals. The case referred to was reported a suspicious animal, probably affected with glanders. On examination I found a four-year-old gray colt much emaciated and having a very deep cough, which was readily excited upon moving the horse to a sharp trot for a few yards. At times a profuse discharge issued from both nostrils, and notwithstanding the fact that the colt was, during the summer, allowed to run in very luxuriant pasture, yet the consumption seemed steadily to progress. After explaining the nature of the disease to the owner, a *post-mortem* was determined upon, and I found a large proportion of both lungs invaded with characteristic "tubercle," establishing the cause of the sickness beyond any reasonable doubt.

My investigations with regard to diseases of sheep are explained in the following letter, addressed to the Live Stock Commission last year:

OFFICE OF THE STATE VETERINARIAN,
AGRICULTURAL COLLEGE, MICH.,
August 26, 1892.

To the Members of the State Live Stock Sanitary Commission:

GENTLEMEN—From recent investigation by your order, as well as reports from different parts of the State, I am led to believe that many flocks of sheep are invaded by parasites, in the shape of round and tapeworms, to, in some instances, quite an alarming extent, as large proportions of young flocks are carried off with them and even some of the older animals.

While in the advanced stages of the disease little can be done by way of effecting a cure in the majority of cases, yet in the early stages proper remedies save many animals that would otherwise perish; and on the other hand a great deal can be done by way of warding off an attack when we are familiar with the causes and do not expose our animals to them. So to bring the subject before those interested in sheep breeding I address this communication to you, describing somewhat briefly the causes, symptoms, treatment and prevention, in order that you may give it wider circulation.

THE ROUND WORM.

The first of the worms to be described is a thread like creature, that in southern latitudes produces a disease known as lombriz. The worm measures when mature from say half an inch to an inch in length, and is say a little thicker than a stout horse hair. They are to be found in innumerable quantities closely adhering to the lining membrane of the last stomach of the sheep, and when the sheep has recently died, close observation will reveal the worms wriggling about with the most eccentric contortions; their color at this time is rather of a reddish chocolate hue.

The life history of the worm is thought to be of a simple nature, it being generally conceded by investigators that the eggs of the female are carried off through the bowels of the sheep, dropped upon the ground, and when washed out of the excrement by heavy rains or otherwise, are devoured by other sheep and hatched in their stomachs, where they produce eggs, and thus keep up the circulation of the disease.

THE SYMPTOMS

which these little worms produce are not very well marked from other parasitic diseases of the bowels, but when they appear in large quantities they produce general languor, a tendency to drop behind the well sheep of the flock, with hanging head and drooping ears, and an expression of general debility showing that something is decidedly wrong. The bowels may at first be costive, but usually give way to diarrhœa.

With such symptoms a *post-mortem* of one or more animals should be made, when these worms will often be found in large quantities in the fourth or last stomach.

TREATMENT.

There are many good remedies used in the treatment of vermicular diseases, so much so that it is hard for the writer to form an opinion as to the best one, but one which is good, easy to obtain, and convenient to handle, is spirits of turpentine.

To proceed take 1 part of spirits of turpentine and add to it 16 parts of sweet milk; shake well and use as a drench. The dose of the mixture for lambs from 3 to 6 months old is 2 ounces; from 6 months to 1 year, 3 ounces; and from 1 year upwards, 4 ounces. One dose will often be sufficient, if not repeat it in say three days. To give the medicine let an assistant place the animal upon its haunches, holding it between his knees face outwards; open the mouth and pour the medicine slowly down from a long necked bottle or horn.

PREVENTION.

Separate healthy from unhealthy sheep, feed them from racks and water them from troughs; in other words do not allow them to eat or drink anything which may have been contaminated with the excrement of affected sheep.

THE TAPE WORM.

The second worm is of the tape worm order, differing very much from the last one in every particular. I have always found them in the small bowel commonly called the *gut.* It varies in length from a from a few inches to 20 feet, and is say one-half an inch wide at the widest point, tapering gradually towards the ends, the head or front though being considerably smaller than the tail (?) end; it is made up of innumerable segments, which when passed out of the bowels in a single manner frequently adhere to the pellets of fœcal matter and resemble little white maggots. Sometimes several feet of a worm will be voided at one time.

The life history of this parasite is not yet thoroughly worked out, though valuable testimony goes to show that unlike most other tape worms, it is not necessary for an intermediate host to keep up the circulation of the disease, but that they pass from sheep to sheep through consumption of the eggs with the food. These worms, like other varieties are more destructive to lambs than older sheep, and they often invade them in large numbers. I have counted as many as eleven side by side, giving the appearance of entirely blocking up the bowel.

THE SYMPTOMS

which they produce vary with the individual. Sometimes nothing appears to be wrong when all at once the animals will be affected with colicky pains, diarrhœa and death in a few hours; again other animals show general symptoms of distress for some days, the belly becomes swollen with gas, fœces yellow and slimy or hard and pellety, usually having segments of the worm upon it; the animal becomes debilitated and things go from bad to worse till death closes the scene. Some strong animals are able to resist the ravages of the parasites and eventually make a thorough recovery. *Post-mortem* will reveal, when the bowel is split with a knife, a white tape like looking object which no doubt will prove to be the worm.

These worms are often present with the thread worms, and even other varieties in the same animal at the same time.

The disease is very destructive to lambs and yearlings.

TREATMENT.

As turpentine is alike destructive to tape as well as round worms, the same line of treatment adopted for the other disease will answer for this one, indeed the one dose will often cause the death of both the thread and tape worms and cure the disease.

PREVENTION.

At this writing I have notning to add to what I have said concerning the prevention of the first disease. As the worms are taken in in the same way, the same method of prevention will answer both case. I am, gentlemen,

Yours respectfully,

E. A. A. GRANGE, *State Veterinarian.*

In closing this report I desire to express a feeling of much gratitude for the agreeable and cheerful assistance I have received from all those with whom I have come in contact while in the discharge of my duties.

All of which is respectfully submitted by

E. A. A. GRANGE,
State Veterinarian.

FIFTH BIENNIAL REPORT

OF THE

LIVE STOCK SANITARY COMMISSION

FOR THE

YEARS 1893 AND 1894.

BY AUTHORITY

LANSING
ROBERT SMITH & CO., STATE PRINTERS AND BINDERS
1895

STATE LIVE STOCK SANITARY COMMISSION.

MEMBERS OF THE COMMISSION.

H. H. HINDS, President,	STANTON.
J. J. WOODMAN, Secretary,	PAW PAW.
J. E. BARRINGER,	ARMADA.

STATE VETERINARIAN.

PROF. E. A. A. GRANGE,
STATE AGRICULTURAL COLLEGE,
LANSING, MICHIGAN.

REPORT

OF THE

STATE LIVE STOCK SANITARY COMMISSION

FOR THE BIENNIAL PERIOD OF 1893 AND 1894.

To Hon. John T. Rich, *Governor of Michigan:*

Sir—The State Live Stock Sanitary Commission have the honor to submit the following as their fifth biennial report, covering the years 1893 and 1894:

The live stock sanitary laws and regulations of the general government are becoming so perfected and systematized that the danger of importing contagious and infectious animal diseases of a malignant character from other states and countries is being reduced to the minimum. The careful administration of our own laws, than which the statute books of no other state or country carries more effectual ones, makes it possible for us to inform you that comparatively nominal losses are now falling to the lot of the Michigan stock growers from contagious animal diseases. The fifth biennial period of the existence of this Commission, now under review in comparison with the four periods preceding it, shows remarkable progress along the lines indicated. With the exception of tuberculosis and actinomycosis among cattle and swine plagues as affecting the hog, your Commission feel well seized of ways and means of fully controlling and stamping out such outbreaks as may occur, without extravagant losses either to the State or to individuals. As to the three diseases to which an exception is noted above, and as to the causes, manner of dissemination, prevention, suppression, treatment and cure of the same, the scientists are still groping in darkness in regard thereto. We have no hesitancy in saying that our live stock sanitary laws, when intelligently administered, will come as near controlling their dire effects as will the statutes of any state or country that it has been our privilege to study or observe.

DISEASES OF HORSES.

Glanders: That glanders and farcy will continue to exist among the horses of the State for an indefinite period in the future is probably true, but it is equally true that this commission has been able to largely drive these diseases from the agricultural districts of the State to the newer portions of our rural districts and the slum stables of the towns and cities. When this commission commenced its attack on this disease it was found to exist on many fine farms in the older or southern portion of the State and in liveries and private stables within the cities and villages. Not a year then passed but that cases of death from this loathsome disease among the human family were called to our attention. Now the situation is entirely changed. Whole congressional districts seem to be exempt from it. The cases are single and isolated. Now we find less cases in a year than we formerly found in a school district, village or perhaps livery stable. So far as we are informed no human being within this State has died from this incurable malady during the last two years. Our plan of dealing with all horses pronounced affected with glanders by competent authority, is immediate destruction. The previous condition, record, value or ownership of the animal cuts no figure. Immediate destruction is inevitable.

Our horse stock seem to be at present practically free from other contagious diseases of a malignant character.

DISEASES OF CATTLE.

Texas Fever: The commission feel warranted in announcing that notwithstanding the fact that from 10,000 to 15,000 so called Texas cattle are slaughtered annually in Detroit and hundreds of thousands of the same disease-bearing cattle are annually transported across our State among the cattle of commerce, our regulations are so comprehensive and effective in controlling the traffic, that danger to our Michigan cattle from said cause has practically ceased except through some party or parties absolutely violating some provisions of said rules and regulations. As evidence of the truth of the above statement, we cite the fact that under the normal operations of said rules, as we carry them out, not a single case of Texas fever has occurred in this State during the last three years. The one exception to the above general statement shows the absolute necessity of strictly obeying said regulations, and in brief is as follows: In the early fall of 1893, the Grand Trunk Railroad Company caused four cars of Texas cattle to be thrown out of a through stock train at the country station called Morris. The cattle contained therein were unloaded in the yards there, were held two days, were twice driven along the highway for nearly a mile to water, when they were again loaded up and passed on out of the State. No native cattle came directly in contact with these Texans or even came in sight of them, but all cows or other cattle belonging to farms that abutted on the strip of road over which the Texans went to water, and that were handled over this piece of road, took the disease, usually with fatal results. The Grand Trunk Railroad Company under pressure paid the damage done by their officials disobeying our Texas fever regulations. So far as protecting our cattle growers from loss from Texas fever, we think we have fully mastered the situation.

Actinomycosis or Lumpy Jaw: This disease, which we have never observed in this State except in the bovine animal, has sorely perplexed our investigations by the very peculiar manner of its coming and going, and the wholly unaccountable way or manner of its communication. We have periods when there are apparently no cases in the State and suddenly, without apparent cause, an outbreak will occur in a herd or locality without apparent exposure and the disease may in a short time become epizootic over a neighborhood or perhaps a township, and after a few months run may subside and disappear about as mysteriously as it came. It, however, in all outbreaks does much harm as many cases fail to recover and in time have to be destroyed. The disease appears to be in some manner communicable, but we are unable to exactly determine how. We have observed experiments where it appeared impossible to communicate it to other cattle either by association or inoculation. In fact in all the cases in our observation, in attempts to artificially communicate it, the experiments have produced negative results. We also have observed that a large percentage of cases, when handled in the early stages, yield to treatment, both with the knife and by prescriptions. Also we have noted many recoveries without treatment. The general government, through the bureau of animal industry, after repeated experiments, submit the following prescription:

Treatment: "The medicine used by the bureau of animal industry in the treatment of actinomycosis or lumpy jaw is the iodide of potassium. The dose should never exceed one-quarter dram for every one hundred pounds live weight. The proper dose being from two to three drams according to the size of the animal and the extent of the disease. This dose may be given once a day for from five to six days, when the animal may show slight symptons of iodism, viz.: Discharge of thick mucus from the nose, and flowing of tears. The animal will become constipated perhaps, but this may be easily remedied by giving a dose of glauber salts, and some bran mash. This will restore the appetite, and two days after the last dose was given, the animal will be ready for another week's treatment, and so on until a cure may be effected. If these precautions are taken, no ill effect will result from the treatment, and if properly fed the animal will gain in condition uninfluenced by the medicine. There is, however, a great difference as to the effect of the medicine on different animals, but any farmer who takes an interest in seeing his stock do well, will easily preceive when it is best for him to stop and give the animal a rest for two or three days. The medicine is best given dissolved in soft water, and given by means of a horn or long necked bottle. One dose of the medicine, say one and one-half to two or three drams as the case may seem to require, is dissolved in about a pint of water, seize the animal by the nose to hold up the head, and the contents of the bottle is emptied into the mouth without fixing or securing the tongue in any way."

From our own observation in noting the effects of this treatment, we think it has high merit. From the above it may be readily inferred that in dealing with actinomycosis we do not summarily condemn and destroy animals found affected with it. We fully isolate and quarantine affected animals that they may be treated and cured so far as the several cases will yield to treatment.

Bovine Tuberculosis: No other subject relating to animal industry is creating a tithe of the interest of all classes of citizens, east and west, north and south, as is the subject of tuberculosis in cattle. This condition of public interest is probably as it should be, owing to the fact that no animal product is so universally utilized, in one form or another, for human food, as is the milk of the cow. Milk is not only the most perfect food itself known to man, but its principal product, butter, is universally used to make palatable even bread itself, which is commonly accepted as the staff of life. Milk itself, as well as its products, namely butter and cheese, usually goes down the throats of the human family without sterilization. Hence it is at once apparent that any living organism which may be drawn from the udder of the cow in the process of obtaining this universally used food called milk, will be floating in a safe and sure vehicle to the stomachs of human beings, a rather broad avenue to the physical economy of all mankind. Should there be any disease common to man and the cow communicable only upon the germ or bacilli theory, it looks at once reasonable that an efficient way to spread and disseminate the disease would be for man to partake in unstinted quantities of the dairy products of cows affected with the disease. These products need only be the ordinary commercial dairy products of the cow, provided always the cows composing the dairy are thoroughly affected with the communicable disease in its active or acute form. Hence it is at once apparent why the great interest as to the wholesomeness of the commercial products of the cow. Extensive experiments and investigations are now being carried on in this country, particularly in the eastern states, with a view of detecting and wiping out tuberculosis among cattle. Science offers, up to present date, but little encouragement of curing this disease among the lower animals, and therefore destruction of all diseased brutes seems to be the only remedy for suppressing the disease. Hence the large expenditures during the last two years on this line in some States, notably New York and Massachusetts. This disease is not only insidious in its early and often latent invasion of the economy of the bovine kind, but it is very difficult of detection in a large percentage of cases, even by the expert by a physical examination. Fortunately for the investigator of our times, a German scientist, Koch by name, has discovered and prepared a lymph which is called tuberculin, and which is a very valuable diagnostic assistant in the detection of animals affected with tuberculosis. This fluid is a highly sterilized product of tuberculosis itself and is incapable of producing or generating tuberculosis. Yet it produces a marked effect upon animals affected with tuberculosis. Not only have large quantities of the Koch lymph been imported to this country, but our government being possessed of the formula has prepared it in considerable quantities, which, upon experiment, seem quite as true to its purpose as the Koch tuberculin itself. On general principles it might be assumed that the cattle of the west, handled under natural conditions with very little close housing and then only in winter, would not furnish so good a field in which to discover large numbers of cases of tuberculosis, as would be found in the much narrower and often crowded environments of the cattle of the east. It is also undoubtedly true that among thoroughbred cattle, where all specimens whether puny or vigorous, are preserved on account of supposed pedigree value, a greater tendency and predisposition to contract and carry along disease is probable than among grade or common cattle, where only the most vigorous or promising are permitted to survive. Be that as it may, however, it is well known that all Michigan cattle are not above reproach or suspicion in so far as tuberculosis is concerned. This commission has not been behind like bodies in other States, in causing careful and quite general and intelligent investigations of our cattle stock along the line as indicated above. The commission have caused the State Veterinarian to make investigations and apply the tuberculin test in all cases reported where there existed a fair presumption that cattle were affected with tuberculosis. These investigations have covered a wide field extending from the southern part of the State to the upper peninsula, and among several scores of cattle tested, principally cows, a remarkably small percentage of cases of tuberculosis have been discovered. We have satisfaction in expressing the opinion that the cattle stock of this commonwealth will compare favorable, so far as general health is concerned and particularly so far as exemption from tuberculosis is concerned, with any state in the union where cattle are kept within the environments of fenced farms. We do not desire to be understood as saying bovine tuberculosis does not exist in this State. On the contrary, we fear there are many cases of it. We are also of the opinion that this commission, and all good citizens as well, should pursue a vigorous warfare against it so that its ravages may be reduced to the minimum, and that Michigan milk and dairy products may be quite as wholesome as are like products in any other commonwealth on the face of the earth.

DISEASES OF SHEEP.

It is entirely apparent to the most casual observer who passes up and down the avenues of this State, that the sheep industry within our borders, once not only a chief factor in our live stock industry but a corner stone of our whole agricultural fabric, is exceedingly sick and the inoffensive, mild-mannered and industrious sheep is dying in vast numbers. From the universal and simultaneous development of the destructive symptoms common in every county of the State where sheep exist, it might readily be inferred that the malady had become epizootic and it undoubtedly has. While the trouble is new, we are able to diagnose it and if permitted so to do we could readily improve its condition, but as the disease is political and not physical, it lays wholly without our jurisdiction. We are able to say that the physical condition of Michigan sheep never approached more perfect freedom from contagious or infectious diseases than now. We note occasional development of parasitical trouble among sheep, such as scab, foot-rot or internal parasites, but by prompt action in the line of quarantine, the destruction of diseased animals, etc., we have been able to soon suppress any and all outbreaks.

DISEASES OF SWINE.

HOG CHOLERA AND SWINE PLAGUE.

There has been a large number of outbreaks of what is termed "hog cholera" in different sections of the State, during the past two years, and farmers have sustained large losses from the disease, amounting in the aggregate to many thousand dollars. The State has also sustained a heavy loss. The disease broke out in the herd of the Eastern Michigan Asylum in August, 1894, and out of 174 animals, 102 died. But few of the outbreaks in the State have been reported to the commission, and but little notice taken of the destructive contagion by local boards of health, hence where the disease has once started in a locality, its spread has been rapid and the losses correspondingly large. From a series of experiments and investigations made by the National Bureau of Live Stock Industry, and information recently promulgated, there seems to be good reason to infer that the cause and nature of the disease is better understood than heretofore; and that measures may be instituted to prevent its introduction and spread with more confidence, and that remedies may be applied in its first stages with reasonable assurance of beneficial results.

On account of the similarity of the two diseases, hog cholera and swine plague, in symptoms, progress, and fatality, together with the more important fact, that while there is no doubt a difference in typical cases, yet so difficult to diagnose that it can only be satisfactorily done by microscopic examination and culture of the germs, we have heretofore treated them as one and the same disease; and for all practical purposes might continue to do so, as the same treatment, prevention, and means necessary to prevent their introduction and spread are recommended in both cases; and the two diseases are sometimes found doing their destructive work together. But the following information compiled from the government reports, will no doubt be of general interest, and perhaps may serve to inspire greater diligence in guarding against the diseases.

"Both hog cholera and swine plague are caused by bacteria, which have now been so carefully studied that they may be easily identified by persons accustomed to bacteriological researches. The hog cholera germs are slightly larger and more elongated than those of the swine plague, and are provided with long thread-like appendages which enable them to move rapidly in liquids; while the swine plague germs have no such organs, and are unable to move except as they are carried by the liquid in which they float."

The result of the experiments shows that the germs of hog cholera find their way into the bodies of swine with the food and drink, by infection, through sores and flesh wounds, and by inspired air; while those of swine plague are taken almost entirely with the air and through the lungs. Hog cholera germs are very hardy and vigorous. They are able to live for a long time and multiply in the water of ponds and streams. They may live in the soil for at least three months, and in accumulations of straw and litter for a much longer time. They withstand drying and other adverse conditions in a remarkable manner, and will survive in a frozen state for two or three months. On the contrary, the germs of swine plague are very delicate and easily destroyed. They soon perish in water or by drying, and every condition of life and growth must be more favorable than is required for hog cholera germs. "They are widely distributed and probably present in all herds of swine but without sufficient virulence to produce disease except by unusual conditions." They are found in the air passages of nearly all of the domestic animals but do not seem to affect them. "It is not unreasonable to suppose that this bacteria, living in the air passages of other animals and harmless to them, may be the starting point of this disease in swine; and that some of the outbreaks of swine disease in the Western States may be due to the cattle with which the swine are herded for feeding purposes. While no positive demonstrations of such results have been made, it is desirable that those engaged in stock raising should have their attention called to such possibilities. On the contrary, the bacteria of hog cholera is not usually present, and must be introduced from infected herds before this disease can be developed."

Cause of Outbreaks: In every instance where definite information could be obtained, outbreaks of hog cholera, or contagious diseases among swine, have been traced to the importation of swine from other States or from infected districts in this State, or from railroads transporting diseased animals. There is no question but what the use of cars, in which diseased swine have been transported, for carrying other live stock and freight without being disinfected, is a fruitful source of many outbreaks of hog-cholera. When the germ is once planted and the disease makes its appearance in a herd, its spread to other herds in the vicinity can only be prevented by exercising and enforcing the most careful and rigid measures. In one instance which came to the knowledge of the commission, two hunters passed through a field where diseased swine were kept, and then through an enclosure on another farm some distance away where there were healthy swine; and in a few days the disease broke out in the latter herd. In another case the evidence seemed almost positive that the germs of the disease were carried by the water of a heavy shower running down a ravine usually dry; and in other instances they seemed to have been carried through drain tile; showing conclusively that the disease can be carried from herd to herd, and from farm to farm, not only by "flesh devouring animals, birds and insects," but by water courses and heavy showers washing under fences and across enclosures, and on the feet of persons and animals. A lump of soil or manure no larger than a mustard seed, adhering to the shoe of a person, or foot of a dog or other animal, may carry germs of the contagion sufficient to inoculate a herd of swine.

Time of Incubation: The time that elapses between infection and the appearance of the symptoms of illness, known as the period of incubation, varies from four to twenty days. During this period the germs are multiplying slowly, and gradually overcoming the vital powers of the animal by means of the poisonous substances which they produce as the result of their growth.

Symptoms of the Diseases: "There is first seen the signs of fever, shivering, unwillingness to move, more or less loss of appetite, elevation of temperature which may reach 106 to 107 F.; the animals appear stupid and dull, and have a tendency to hide in the litter or bedding and remain covered by it. The bowels may be normal or constipated at the beginning of the attack, but later there is generally a liquid and fetid diarrhea, abundant, exhausting, and persisting to the end. The eyes are first congested and watery, but soon the secretion thickens, becomes yellowish, accumulates in the angles and gums the lids together. The breathing is more rapid than usual and may be oppressed and labored in the latter stages. There is a cough, which, however, is not very frequent, and generally heard when the animals are driven from their beds. It may be a single dry cough, or it may be paroxysmal. The skin is often congested and red over the abdomen, inner surface of the limbs, under surface of the neck, and on the ears. The color varies from a pinkish red to dark red or purple. An eruption is sometimes seen, which leaves crusts or scabs of various sizes over the skin. There is rapid loss of flesh, the animal grows weak, stands with arched back and abdomen drawn up, and walks with a tottering, uncertain gait. There is less and less inclination or ability to move, and the weakness and exhaustion increases until death ensues."

The symptoms of swine plague are not noticeably different from those of hog colera, except in the former the breathing is sometimes more oppressed and difficult, and the cough more frequent and painful. As the agents which destroy one of these germs will generally destroy the other, the difficulty of distinguishing between them, is therefore of no great importance in the practical work of controlling them.

Treatment of Hog Colera and Swine Plague: Will the diseases yield to treatment? And if so, what are the remedies? These are the questions which most interest farmers and swine growers. It is safe to say, that there has never been discovered a remedy for any of the infectious diseases of man or animals which will cure every case. Some forms of these diseases are so virulent and rapid that the animals are past help before they are known to be sick, hence there is no time to apply remedies with beneficial effect.

In many outbreaks the type of the malady is less virulent and there is time to treat the animals after well developed symptoms of the disease are present, and the whole herd, after some of the swine are sick. The government experiments of 1894 seem to indicate with some degree of certainty, that treatment if properly applied may be successful, and the following formula is recommended:

Wood charcoal	1 pound
Sulphur	1 "
Sodium sulphate	1 "
Antimony sulphide	1 "
Sodium chloride	2 pounds
Sodium bicarbonate	2 "
Sodium hyposulphite	2 "

These ingredients should be completely pulverized and thoroughly mixed.

Dose, one large tablespoonful of the mixture once a day for each 200 pounds weight of the hogs to be treated. The medicine should be given in soft feed, as corn meal or ground oats,.or crushed wheat, mixed with bran, or middlings well moistened with hot water.

Animals that are too sick to eat the mixture, should be drenched with the medicine, well shaken up in water. This can be done by slipping a noose over the upper jaw or snout of the animal and elevating its head sufficient to allow the medicine to be poured from the horn or drenching bottle into the corner of the mouth. Pull the cheek away from the teeth and let the medicine run into the pouch thus formed. Great care should be exercised in drenching hogs or they may be suffocated. The medicine should be poured slowly and time given for the animal to swallow. This medicine is also recommended as a preventive to these diseases, and for this purpose should be put in the feed of the whole herd, taking care that each animal receives its proper share. It is also claimed to be an excellent appetizer and stimulant to the processes of digestion and assimilation, causing unthrifty hogs to assume a thrifty condition and take on flesh.

It must not be forgotten that in order to secure good results from this treatment, diseased animals must be kept in dry and comfortable quarters and fed on soft and easily digested food. The sick should be separated from the herd, but the sick and well should be treated alike, in order to cure the former and prevent the incubation of the disease in the latter; for prevention is cheaper and more satisfactory than medical treatment.

Care to Guard Against the Disease: Healthy swine should not be allowed to come in contact with diseased animals or herds, strange swine the history of which is unknown, offal from establishments using carcasses of swine, recently infected ground or buildings, railroads carrying swine, or polluted streams. When the disease has actually appeared in a herd, heroic measures should be resorted to at once, to stamp it out and prevent its spread. The herd should be rigidly quarantined and as far as possible, all means for conveying the germs of the disease to other herds, should be guarded against. All dead animals should be deeply buried, or burned at once, and vehicles upon which they are carried away disinfected. The yards and premises where diseased swine are kept should be repeatedly and thoroughly disinfected, and when vacated not only disinfected but closed up from all other animals until there is reason to believe that the germs have been destroyed. Mere freezing does not kill the germ; but the disease usually dies out during the winter, if the frost can penetrate the litter and soil in every portion of the yards and under the buildings where the diseased animals have been kept. The germ is often protected during the winter, by straw stacks, and litter in the yards and under the buildings.

How to Disinfeect: The following disinfectants are recommended:

1. Slacked lime, in the proportion of one-half pound lime to one gallon of water.
2. Equal volumes of crude carbolic acid and ordinary sulphuric acid mixed together, and two ounces of the mixture added to a gallon of water.
3. Sulphuric acid added to water, one ounce to a gallon.
4. Boiling water, where the application can be made direct.
5. Corrosive sublimate (mercuric chloride), in the proportion of one dram to a gallon of water.

The lime is the best and cheapest where it can be used.. No. 2 is said to be more active. Place the vessel containing the crude carbolic acid in cold water and then add the sulphuric acid, to prevent undue heating of the liquid. The solution should be made in wooden vessels, as sulphuric acid and corrosive sublimate attack metals. As corrosive sublimate is very poisonous, the solution should not be made stronger than indicated. Each of the solutions recommended is strong enough to kill hog cholera and swine plague bacteria.

OTHER ANIMAL DISEASES.

Other contagious or communicable diseases of live stock, some of which are readily recognizable and some are not, cause more or less loss annually to our stock growers, but do not usually cause large losses in a single outbreak. It becomes necessary to annually destroy some live stock, of all kinds, affected with rabies. In our observation this disease is only communicated by dogs, and when the citizens of a neighborhood or township having rabies in their midst, rise up and cause the destruction of all unmuzzled dogs within their midst, the outbreak usually subsides.

The commission desires to request all parties, whether officials or private individuals, when reporting cases of contagious disease, to note such particulars in relation to the diseased animals as will at once exactly and definitely locate the cases. Kindly state name of owner or party in charge. Also exact location in township, giving section or part of section if practicable. Give name of nearest railroad station and distance therefrom. If located about equal distances from different stations, particularly if stations are located on different railroads, give names of each. Give as detailed a history of case or cases as circumstances will permit. This information is essential to facilitate the speedy and economical investigation necessary in all cases.

It is made the duty of this commission "to protect the health of the domestic animals of the State from all contagious or infectious diseases of a malignant character." In trying to compass that important but sometimes impossible duty it has been our aim to thoroughly utilize all means of enlightenment as to the operation of animal diseases that did not lay wholly without our reach. While we have given careful ear and keen sight to the work and teaching of the scientist, we have not despised the knowledge absorbed from the observations of such as have been learned in the hard but efficient school of experience. We have lost no opportunity to mingle in the conventions of our fellows and have been attentive listeners and sometimes participants in the assemblies of scientific and book learned gentlemen, who engage in extensive controversies as to theories and at the same time throw off large chunks of practical, reasonable facts. In fact unlike the Chinese, we have spent no time in looking over our shoulders, but have engaged our attention steadily at the front in order to administer the trust placed upon us in a thoroughly up to date manner. While leaning strongly to the teachings of scientific theory, we have steadily held an anchor to the windward restricted by plain, practical, "business horse sense." We refer to the present physical condition and health of the domestic animals of the State as a specimen of the result of our work.

The report of the State Veterinarian is herewith submitted and attention called thereto.

H. H. HINDS,
J. J. WOODMAN,
J. E. BARRINGER,
State Live Stock Sanitary Commission.

LANSING MICHIGAN,
February 28, 1895.

REPORT OF THE STATE VETERINARIAN.

Lansing, January 1, 1895.

HON. H. H. HINDS, *President of the State Live Stock Sanitary Commission:*

SIR—I herewith beg leave to make the fifth biennial report of the State Veterinarian for the years 1893–4.

I have been called in all directions of the State to investigate alleged outbreaks of contagious diseases among live stock, but am pleased to be able to say that nothing of a very serious nature has occurred.

Among horses I have condemned 47 animals as being affected with glanders, and this is the only malignant form of contagious disease that has attacked this class of animal in our jurisdiction during the past two years.

Among sheep I have had occasion to visit three flocks which were affected with several different kinds of worms, two varieties of them were found in the stomach and bowels of individual animals, and are the same as those described in my last report; while two other varieties were found in the lungs, but they were imported animals, and being promptly disposed of, the disease was not permitted to spread. As it is more than a year now, since the investigation was made, and no new cases having been brought under my notice since then, it seems reasonable to suppose that lung worm in sheep, does not prevail in Michigan.

Among hogs I have only had occasion to visit two herds, and found them affected with hog cholera.

CATTLE.

I have investigated two outbreaks of actinomycosis or lump jaw a disease described somewhat in detail in my *third* biennial report.

I have also had occasion to investigate tuberculosis and have applied the tuberculin test in two hundred and seventy-six animals, but only discovered one which showed reaction indicating the presence of *tuberculosis*.

This animal was at once slaughtered and post mortem verified the diagnosis made through the use of tuberculin.

In one cow where the tuberculin was applied it did not react. That is to say, it did not increase the temperature but in her case the temperature was several degrees above the normal the day the test was made, which possibly accounts for the inability of the material to raise it higher. This cow died two months after the test was made; when, a careful post mortem revealed the presence of tuberculosis in her lungs and liver. As *tuberculin* has created so much public interest during the last few years it may not be out of place for me to say here, that soon after its discovery by the far famed Prof. Koch, it was thought to be a curative agent for consumption (tuberculosis), although extensive investigations in this line did not produce flattering results, yet the discovery of the material has been of great benefit as a diagnostic agent, which may be regarded as a step toward the cure or eradication of the disease.

During the administration of the material, it was noticed that elevation of temperature was a common accompaniment in those persons who were affected with consumption, while in those apparently not affected elevation of temperature seldom manifested itself. These circumstances led to its use as a diagnostic agent for tuberculosis, and it was soon used by veterinarians as a means of determining whether animals were or were not affected with the disease. But it was maintained by the pioneers in this work that it could not be relied upon with sufficient certainty to make it a practical agent for general use; it being contended that after injection, elevation of temperature occurred in some animals which upon post mortem did not show evidence of the disease while on the other hand some cases of advanced tuberculosis did not react. More recent investigation has tended to show that in those cases which showed reaction and not tuberculosis on post mortem examination, in all probability the fault was with the investigator and not in the tuberculin; while in those advanced cases it is now supposed that the amount of tuberculin already in the body interfered with the manifestation of the effects of the minute dose which was injected.

Repeated investigations in various parts of the United States during the past year or two gives color to the idea, that the tuberculin test can be relied upon with more certainty in detecting the disease than any other known method, especially in the early stages, which may lead to the more general use of it in the effort to exterminate that subtle malady which attacks both man and beast.

During the summer of 1894 I was called upon to investigate a supposed outbreak of the much dreaded Foot and Mouth Disease, but fortunately it proved to be a benign form of *eczema* which yielded readily to treatment.

Yours obediently,

E. A. A. GRANGE.

State Veterinarian.

SIXTH BIENNIAL REPORT

OF THE

LIVE STOCK SANITARY COMMISSION

FOR THE

YEARS 1895 AND 1896

BY AUTHORITY

LANSING
ROBERT SMITH PRINTING CO., STATE PRINTERS AND BINDERS
1897

STATE LIVE STOCK SANITARY COMMISSION.

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STATE VETERINARIAN.

PROF. E. A. A. GRANGE,
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Lansing, Michigan.

REPORT

OF THE

STATE LIVE STOCK SANITARY COMMISSION

FOR THE BIENNIAL PERIOD OF 1895 AND 1896.

To HON. HAZEN S. PINGREE, *Governor of Michigan:*

The Michigan State Live Stock Sanitary Commission submits the following as its sixth biennial report:

As far back as 1880, and perhaps at an earlier date, the farmers of the State, and, more especially, those actively engaged in the live stock industries, began an active discussion of the propriety of asking the legislature to enact some suitable and effective live stock sanitary laws. All parties conceded the necessity of the same, in view of the large extent of the live stock interests of the State. Glanders existed in most of the counties of the State. Scab and foot rot were not uncommon among sheep. Texas fever killed hundreds, yes, thousands of dollars worth of our cattle annually. Contagious pleuro pneumonia had been imported forty years before, and had a substantial foothold among herds of milk cows in parts of Pennsylvania, Maryland, New Jersey, New York and the New England states, and occasional herds coming over the Alleghanys with migrating families were bringing the dread scourge westward. Hog cholera was devastating the swine herds of Ohio and Illinois, and Michigan was having sufficient outbreaks of this plague to know something of the devastating and destructive character of the malady so far as the swine breeder was concerned.

The usual result of discussion among intelligent men is action. The history we are now recalling was no exception to the general rule. This class of legislation was entirely new in this State and practically new in this country. The trail to be pursued was not even blazed out, much less beaten by a path one might follow. All the live stock associations and many of the agricultural societies of the State, as well as other gatherings of farmers, considered the subject, and various forms of proposed legislation were exploited. Large bodies move slow. They usually move effectively.

The result reached was that all interested fully agreed that a Commission was the proper body to be appointed under a law for protecting the live stock of the State from all contagious or infectious diseases of a malignant character. A committee of gentlemen were selected representing the different live stock interests, to exploit the idea and draw a bill or bills adequate to the occasion and ask the legislature to pass the same. The result of the labors of this joint committee was the drafting of two bills, which were practically the same as the present live stock laws of the State. These bills were endorsed by the various live stock associations at their annual meetings in 1884. They were approved by the entire membership of the State Board of Agriculture, the State Agricultural Society, and the outgoing and incoming Governors. The outgoing Governor, Begole, called especial attention to it in his exaugural, in view of the fact that the general government had just by act of congress created the Bureau of Animal Industry. Many members elect of the legislature were active in assisting the committee to prepare the bills—one of the committee being a member elect of the house. The bills were duly introduced in the lower house, and after deliberate and protracted discussion, were passed without serious opposition. They passed the senate with the important exception that on the third reading of the general bill, a senator asked that horses and sheep be exempted from the operations of the law. Upon the senator's request, a motion to amend the bill as just indicated carried, and the house concurred in the amendment. Two years later the legislature amended the law, making it operative as to horses and sheep. Few general laws upon our statute books affecting great agricultural interests as these laws do, received more careful and deliberate consideration or more general support both in the legislature and among the agriculturists of the State. These laws have been in active operation for a dozen years as to all domestic animals except sheep and horses, and as to them for ten years. We may fairly pause to meditate as to results.

During that time we have seen Illinois spend hundreds of thousands of dollars, other states vast sums, and the general government itself more than a million of money in wiping out contagious pleuro pneumonia among cattle in the United States, and yet Michigan, lying right along the path of the cattle of commerce in transit from west to east, by the rigid enforcement of quarantine under this law, never had a case of this fatal bovine malady in the State.

Texas fever. While the general law, act 128, session of 1885, took immediate effect, and the Commission was at once appointed under it, yet act 198, commonly known as the Texas fever law, passed by the same legislature, for manifest reasons, did not take effect until 90 days after the legislature adjourned. Before this law became operative, this Commission was called to Detroit to witness some of the ravages of this disease. This was no exceptional year, and yet in Detroit that season over 200 cows, mostly the property of poor people, succumbed to the malady. The estimated value of the same at that date was over $10,000.

Other towns and cities also had outbreaks of Texas fever. Under the operations of this law and the rules of this Commission, not an animal has died in this State for the last two years and no citizen of the State has lost a dollar by the disease during the last five years. It may be inferred that Texas cattle are no longer handled in this State, but that would be a great error, as many hundred more are now annually slaughtered in this State than were slaughtered previous to the enactment of the law, and many thousands more cross the State with the cattle of commerce, than did cross at the period we are now discussing. More than this, we have the satisfaction of seeing the general government adopt the plan of our law in dealing with Texas cattle all over the country.

CATTLE DISEASES.

TUBERCULOSIS.

With contagious pleuro pneumonia banished from the United States, and with Texas fever under complete and perfect control, the cattle grower still faces a serious, insidious, destructive, contagious disease in bovine tuberculosis. There can be no sort of doubt today with an observant cattle grower as to the contagious character of tuberculosis or consumption among cattle. This Commission is actively engaged in suppressing such outbreaks as are brought to its attention. This Commission is of the opinion that the general cattle stock of the State are but little affected with this disease, but in herds where the disease has a foothold, and the conditions and environments are favorable to its development, a large percentage of the herd will be likely to be affected. We know of no cure for this disease, and have followed the policy of destroying or closely quarantining affected animals to arrest its farther spread. The State Veterinarian, Prof. Grange, treats very fully in his report on this malady, which is attached to this report, and special attention is hereby called to same.

In the carrying out of the policy of condemning cattle to slaughter which are affected with tuberculosis, the Commission have encountered opposition owing to the fact that the law does not provide some plan of appraising cattle thus affected, in comparison to the same class of cattle when in perfect health. As a result of the opposition above referred to, certain parties in Wayne county have invoked the courts of that county to restrain the Commission from executing its orders for the destruction of certain cattle in Oakland county thus affected. While the case here referred to has been pending for a considerable time, this Commission has thus far been unable to advance the case to even a partial hearing in the courts, and therefore no prediction is here entered as to the final results, when the case finally reaches a hearing on its merits.

It is proper to here record that in following the plan of testing such herds of cattle with tuberculin to detect the presence of tuberculosis as are brought to the attention of the Commission, as being likely to be affected with the malady, a wide general field has been covered. We have tested suspicious herds scattered from the south line of the State to the shores of Lake Superior and the extreme western line of the upper peninsula. The experience obtained is a repetition of the experience of all investigations. That is, that this disease is highly contagious among cattle in the latitude and longitude of all of the State of Michigan where herds are kept under favorable environments for its propagation and spread. No breed, color, age, class or kind of cattle are exempt from its ravages.

This Commission for the biennial period under present review have pursued the same general policy as to Texas fever and the handling of Texas cattle, as was pursued during the period covered by our fifth biennial report, with the result as already stated, that there has not been a case of Texas fever in the State during the two years just passed.

It may be further said that the general policy of the Commission as to quarantines and other restraining measures to control and suppress contagious animal diseases, has been substantially the same as was followed during the biennial period next preceding this.

DISEASES OF HORSES.

GLANDERS.

During the ten years the Commission has been dealing with glanders, great progress towards the desired end has been made. Not one case is now reported, where scores were originally reported. Whole congressional districts are now probably exempt from this loathsome disease. This Commission has had ample evidence presented to it, showing that this disease has not only destroyed a large number of horses in this State during the last ten years, but has killed several men and women as well.

The experience of this Commission has not been extensive in dealing with any other of the maladies affecting the horse, except glanders.

DISEASES OF SHEEP.

As to scab and foot rot in sheep. We would not now know where to search for a specimen of foot rot in the State. We know of no cases of scab among sheep at large. Thousands of sheep and lambs are bought in the Chicago stock yards annually, and brought to this State to feed. These feeding sheep have all been exposed to scab as the Chicago, Buffalo, and other extensive sheep yards, are fairly infested with the scab mite. These feeding sheep are all dipped by the feeders and are finally, when fattened, sent to the shambles for slaughter.

Probably the most serious malady in front of Michigan sheep growers today is the various kinds of internal parasites. These lung, stomach, and intestinal parasites are not an original Amercan product. Like many of the weed pests of our fields, the original seed was imported. They are apparently much more fatal with lambs than with old sheep. This Commission can do but little to stay the ravages of these destructive parasites. The sheep growers themselves can do most by the dosing of each individual with some anti-parasitic or vermifuge. The damage to the last years' lamb crop in this State from these internal parasites was very large.

The very interesting treatise on internal parasites of sheep, by the State Veterinarian, Prof. Grange, accompanied with illustrations, and embodied in this report, should be carefully considered by all sheep growers.

DISEASES OF SWINE.

HOG CHOLERA.

As to hog cholera, it is to be regretted that science has as yet not discovered either a preventative or a cure for this destructive malady. This Commission, however, by quarantine and other preventative and restraining sanitary measures, has held in check many outbreaks, and can wipe the disease out of Michigan if science can exploit a plan to eradicate it in any state.

Outbreaks of hog cholera have been numerous in the State during the past two years, and great losses have been sustained by the farmers in many localities, not only by the destruction of animals and herds, but in making it necessary for them to discontinue the raising of swine for a term of years, or until the last trace of the contagion had disappeared from the locality, and the deadly germs of the disease, concealed in litter about pens and yards, and in the soil, had ended its existence. There is no doubt but what the annual losses sustained by the farmers of the State from hog cholera exceed those from all other diseases of domestic animals. Hence, it is important that every precaution known to science, and knowledge gathered from experience with the disease, be used in enforcing sanitary measures to prevent its introduction and spread. While it is quite probable that in some cases the disease may yield to treatment if commenced in the first stages, yet prevention is cheaper and more satisfactory than treatment.

The following from a report of the supervisor of Riga township, in Lenawee county, sent to the Commission in September, 1895, may be of interest in this connection: "I have visited twenty-seven farms in this township, and found that the whole number of swine which were on these farms previous to the outbreak of the disease was 527, of which 303 have had the disease or are now sick, and 224 have already died. The foregoing constitutes about one-fourth of the farms infected with the disease. It already covers one-half of the township and is spreading fast to the east and south." The farms of that section of the State are largely underdrained with tile, and it is reasonable to infer that this drainage from yards and fields where the disease existed, and where the carcasses of dead animals had been buried near the drain tile emptying into open watercourses, was the fruitful and certain cause of the rapid spread of the contagion, and rendered it impossible to arrest its progress. The result was that over a large area of that section of the State, the swine raising industry was practically destroyed. Outbreaks in other portions of the State have been numerous, but not so widespread, uncontrollable and destructive as in the tiled districts. By prompt and thorough action in adopting and rigidly enforcing quarantine and sanitary measures, the disease has in some instances been confined to a single farm, and in others to a very limited territory.

The National Bureau of Live Stock Industry is still carrying on experiments in treating, and for preventing the introduction and spread of the disease, but nothing new of late has been discovered which can be recommended with confidence. The practical work of the Commission, in dealing with outbreaks of hog cholera during the last two years, has fully confirmed the opinion given in our last biennial report, in relation to the nature, symptoms, treatment and means by which it is conveyed from herd to herd, and we deem it proper to not only repeat, but emphasize the following from that report:

"Hog cholera germs are very hardy and vigorous. They are able to live for a long time and multiply in the water of ponds and streams. They may live in the soil for at least three months, and in accumulations of straw and litter for a much longer time. They withstand drying and other adverse conditions in a remarkable manner, and will survive in a frozen state for two or three months.

CAUSE OF OUTBREAKS.

In every instance where definite information could be obtained, outbreaks of hog cholera, or contagious diseases among swine, have been traced to the importation of swine from other states, or from infected districts in this State, or from railroads transporting diseased animals. There is no question but what the use of cars in which diseased swine have been transported, for carrying other live stock and freight without being disinfected, is a fruitful source of many outbreaks of hog cholera. When the germ is once planted and the disease makes its appearance in a herd, its spread to other herds in the vicinity can only be prevented by exercising and enforcing the most careful and rigid measures. In one instance which came to the knowledge of the Commission, two hunters passed through a field where diseased swine were kept, and then through an enclosure on another farm some distance away where there were healthy swine; and in a few days the disease broke out in the latter herd. In another case the evidence seemed almost positive that the germs of the disease were carried by the water of a heavy shower running down a ravine usually dry; and in other instances they seemed to have been carried through drain tile; showing conclusively that the disease can be carried from herd to herd, and from farm to farm, not only by "flesh devouring animals, birds and insects," but by watercourses and heavy showers washing under fences and across enclosures, and on the feet of persons and animals. A lump of soil or manure no larger than a mustard seed, adhering to the shoe of a person, or foot of a dog or other animal, may carry germs of the contagion sufficient to inoculate a herd of swine.

TIME OF INCUBATION.

The time that elapses between infection and the appearance of the symptoms of illness, known as the period of incubation, varies from four to twenty days. During this period the germs are multiplying slowly, and gradually overcoming the vital powers of the animal by means of the poisonous substances which they produce as the result of their growth."

The following treatment recommended in our fifth biennial report has been tried by different parties, and where the directions were followed and the treatment thoroughly used, it has been productive of good results. The government experiments of 1894 seem to indicate with some degree of certainty that this treatment if properly applied may be successful:

Wood charcoal	1	pound
Sulphur	1	"
Sodium sulphate	1	"
Antimony sulphide	1	"
Sodium chloride	2	pounds
Sodium bicarbonate	2	"
Sodium hyposulphite	2	"

These ingredients should be completely pulverized and thoroughly mixed.

Dose, one large tablespoonful of the mixture once a day for each 200 pounds weight of the hogs to be treated. The medicine should be given in soft feed, as corn meal or ground oats, or crushed wheat, mixed with bran, or middlings well moistened with hot water.

Animals that are too sick to eat the mixture should be drenched with the medicine, well shaken up in water. This can be done by slipping a noose over the upper jaw or snout of the animal and elevating its head sufficient to allow the medicine to be poured from the horn or drenching bottle into the corner of the mouth. Pull the cheek away from the teeth and let the medicine run into the pouch thus formed. Great care should be exercised in drenching hogs or they may be suffocated. The medicine should be poured slowly and time given for the animal to swallow. This medicine is also recommended as a preventive to these diseases, and for this purpose should be put in the feed of the whole herd, taking care that each animal receives its proper share. It is also claimed to be an excellent appetizer and stimulant to the processes of digestion and assimilation, causing unthrifty hogs to assume a thrifty condition and to take on flesh.

It must not be forgotten that in order to secure good results from this treatment, diseased animals must be kept in dry and comfortable quarters and fed on soft and easily digested food. The sick should be separated from the herd, but the sick and well should be treated alike, in order to cure the former and prevent the incubation of the disease in the latter; for prevention is cheaper and more satisfactory than medical treatment.

CARE TO GUARD AGAINST THE DISEASE.

Healthy swine should not be allowed to come in contact with diseased animals or herds, strange swine, the history of which is unknown, offal from establishments using carcasses of swine, recently infected grounds or buildings, railroads carrying swine, or polluted streams. When the disease has actually appeared in a herd, heroic measures should be resorted to at once, to stamp it out and prevent its spread. The herd should be rigidly quarantined as far as possible, and all means for conveying the germs of the disease to other herds should be guarded against. All dead animals should be deeply buried or burned at once, and vehicles upon which they are carried away disinfected. The yards and premises where diseased swine are kept should be repeatedly and thoroughly disinfected, and when vacated not only disinfected but closed up from all other animals until there is reason to believe that the germs have been destroyed. Mere freezing does not kill the germ, but the disease usually dies out during the winter, if the frost can penetrate the litter and soil in every portion of the yards and under the buildings where the diseased animals have been kept. The germ is often protected during the winter, by straw stacks, and litter in the yards and under the buildings.

HOW TO DISINFECT.

The following disinfectants are recommended:

1. Slacked lime, in the proportion of one-half pound lime to one gallon of water.
2. Equal volumes of crude carbolic acid and ordinary sulphuric acid mixed together, and two ounces of the mixture added to a gallon of water.
3. Sulphuric acid added to water, one ounce to a gallon.
4. Boiling water, where the application can be made direct.
5. Corrosive sublimate (mercuric chloride), in the proportion of one dram to a gallon of water.

The lime is the best and cheapest where it can be used. No. 2 is said to be more active. Place the vessel containing the crude carbolic acid in cold water and then add the sulphuric acid, to prevent undue heating of the liquid. The solution should be made in wooden vessels, as sulphuric acid and corrosive sublimate attack metals. As corrosive sublimate is very poisonous, the solution should not be made stronger than indicated. Each of the solutions recommended is strong enough to kill hog cholera and swine plague bacteria.

The Commission desires to request all parties, whether officials or private individuals, when reporting cases of contagious disease, to note such particulars in relation to the diseased animals as will at once and exactly and definitely locate the cases. Kindly state name of owner or party in charge. Also exact location in township, giving section or part of section if practicable. Give name of nearest railroad station and distance therefrom. If located about equal distances from different stations, particularly if stations are located on different railroads, give names of each. Give as detailed a history of the case or cases as circumstances will permit. This information is essential to facilitate the speedy and economical investigation necessary in all cases.

The very interesting and instructive report of Prof. Grange, State Veterinarian, is herewith submitted, and especial attention is called thereto.

H. H. HINDS.
J. J. WOODMAN,
J. E. BARRINGER,
State Live Stock Sanitary Commission.

LANSING, MICH., March 25, 1897.

ERRATA.

On pages 28-29 for "tubercules" read "*tubercles.*"
On page 38 for "fetid" read "*fœtid.*"
On page 39 for "Uria" read "*urea.*"
On page 40 for "Cronchia" read "*Cronchiœ.*"
On page 55 line 30 for "not" read "*yet.*"

LANSING, MICH., Jan. 2, 1897.

Hon. H. H. HINDS, President State Live Stock Sanitary Commission:

SIR—Since submitting my last report to your commission I have visited various quarters of the State for the purpose of investigating reported outbreaks of contagious disease.

On previous occasions that loathsome disease glanders occupied more time and attention from the State Veterinarian than all the other contagious diseases combined, and the demands for information concerning it came from so many sources that a description of the complaint was prepared by me, which has already been placed in the hands of the public, through the fourth biennial report of the State Live Stock Sanitary Commission, so it may be unnecessary to say more concerning the peculiarities of that disorder at this time, except to add that present appearances indicate that the labor of the Commission has not been in vain, for reports of outbreaks of this disease are now few and far between, when formerly they were very frequent.

Purpura Hœmorrhagica, or purple fever, has been brought under my notice in a few instances during the past two years, but, as its more salient features have been described and treatment recommended (see page 24, etc., of the fourth biennial report), I will refer the reader to those paragraphs for further information concerning this interesting complaint should it be desired.

The increasing demands for information concerning tuberculosis has caused me to prepare a somewhat detailed description of it, with the hope of answering some of the many questions which are asked from day to day. This disease is, perhaps, creating more discussion in scientific journals, the public press, and amongst laymen in general, than any other in the list of communicable complaints. Is this to be wondered at, when we are told by the highest medical authorities that one-seventh of those people who pass away, die of consumption? So, naturally, we find laymen and scientists alike searching for information concerning it. We also find all civilized governments employing their most distinguished investigators to follow it through various avenues, while state, provincial and municipal authorities, as well as private individuals, are in common trying to combat the army of invading germs which are intent upon the destruction of our bodies. It is encouraging to feel that after years and years of unceasing labor it now begins to look as if mankind would eventually be rewarded for his persistent and meritorious efforts in the stand he is taking to defend himself.

In describing this disease I shall discuss it under the following heads: definition, history of the disease, ætiology or cause, life history of the germ, dissemination of the virus, avenues of infection, symptoms of the disorder, in such animals as cattle, horses, sheep, hogs and birds, treatment of the scourge, and last, but not least, prevention.

NAME.

The complaint is known under a variety of symptoms which have some relation to the symptoms or other phenomena of the disease. The ancient name of phthisis was given to it by the Greeks, and in their language means wasting or consumption, even today the term consumption is frequently used, thus we have pulmonary consumption, consumption of the bowels, etc., etc., the more classical, however, using the terms pulmonary phthisis or tabes (wasting) mesenterica, as the case may be. In Germany the disease is often spoken of as perlsucht, or, as we have it, pearl diseases of cattle, which name is due to the formation in the animal of little pearly-like nodules, or it is sometimes spoken of as schwinden (to vanish or waste away), while in Great Britain the name granulia has been proposed, having reference to little granular enlargements or miliary tubercles, which are often found in afflicted animals.

DEFINITION.

Until somewhat recently tuberculosis was regarded as a sporadic non-contagious disease due to a variety of imaginable causes, all of which were without scientific foundation, and as might be expected, sooner or later fell to the ground, consequently the definition varied according to the symptoms or lesions presented, as, well as to the fancy of the observer. In the present light of what we are pleased to call advanced knowledge, tuberculosis may be defined to be a communicable disease dependent upon a specific micro-organism, known to science as the Koch bacillus of tuberculosis.

HISTORICAL SKETCH.

It is doubtful if there is any disease having a more interesting history than the one in question, indeed it often becomes romantic, for in its subtle manner it strikes down kings and princes, rich and poor, in the same merciless manner, while it invades the economy of the high-class pedigreed cow and wipes her out with as much certainty as it does the native scrub.

The date or the time when this disease made its first appearance on earth is wrapt in considerable obscurity. The bacteriologist contends that long before the existence of man the special bacterium which causes it, lead a saprophytic existence (lived beyond or outside of the animal economy), but through environment it has become a parasitic microbe (one which lives in or upon the animal economy). Be this as it may, the disease has been noticed by veterinary writers, including Columella, who flourished about 1800 years ago, as well as others before him. The history of the disease is usually regarded as extending over five periods. The first was that of ancient history. During all this period the disease was observed only from a clinical standpoint, as the writers of antiquity had no knowledge of tuberculosis in its present sense, and every nodule, mass or induration was then called tubercle. Miliary tubercles were, however, entirely unknown, and when finally discovered were regarded as mere curiosities, but many ancient writers were quite familiar with the fact that disease marked by nodules was attended or caused by the formation of abcesses and ulcers in the lungs, hence phthisis was regarded as belonging to the general class of diseases characterized by the formation of pus. Hippocrates, now regarded as the father of medicine, and who flourished 400 B. C., accepted this view, deriving the pus, from the known proclivity of glands to suppurate, indirectly from the brain, the greatest gland in the body. The brain formed mucous, which, flowing down from the palate and pharynx, produced pus in the lungs. Not every cause of phthisis emanated from the brain. Some pneumonias and varieties of pleurisy were supposed to be followed by phthisis at times; mucous, flowing from the brain and failing to be ejected as sputum, was thought to be converted into pus by the ancients, and even the blood resulting from a hemorrhage was supposed to be changed into pus. Phthisis or wasting was regarded as the outward expression of pus in the lungs, but, singularly enough, not every formation of pus in the lungs produced phthisis. Hippocrates encountered hard masses in the lungs, which he called pymata, and on this account it is now thought that Hippocrates was familiar with tuberculosis; but Virchow has proven that pymatæ were not tubercles even in the anatomical sense, but were abscesses matured for artificial or spontaneous discharge. In the year 50 A. D., Celsus recognized the disease under three heads: The first due to lack of induration, the second the effect of chronic disease and poverty, while the third was wasting, or phthisis, as it was then called. About this time Aretæus contended that phthisis came from pus, using the term pye as a synonym for the disease. But he might also have advanced one step further in his pathology in the separation of empyema, which he regarded as a distinct disease. The symptoms of phthisis were described by this early writer in the following terms: "It is accompanied with heat of a continued character, but latent, ceasing now at no time, but concealed during the day. The sputum was described as being of several different varieties, when coming from people affected with this disorder, such as yellowish white, whitish green, glutinous, etc., etc. The voice was hoarse, neck slightly bent, complexion pale, cough, nose sharp and slender, cheeks prominent and red, eyes hollow, brilliant and glittering, slender parts of the jaws rest on the teeth as if smiling, muscles of the arms wasted, mammary glands shrunken, little if any flesh upon the ribs, articulations at the vertebræ quite visible, other joints clearly developed, prominent and devoid of flesh."Aretæus was wise enough to treat the disease on hygienic and dietric principles, and in many respects the advice of this ancient author was such as is given today by advanced scientists. After the writings of Aretæus little was done with regard to tuberculosis for about 100 years, until Gaylon in 140 A. D. took up the subject and discussed it from the curative standpoint. He recognized the fact that the dry atmosphere was favorable to patients suffering from this disorder, and to secure the healing process in the lungs he advised his patients to go where the air was dry.

The first period ended, historically speaking, with the third century, and the disease seemed to sink into oblivion for about 1400 years, as little advanced progress was made in the study of it, although the Jews as far back as 1135 required the lungs and other parts of cattle used for food to be examined for tubercle, as well as other loathsome diseases. No doubt the slow progress in the study of this disease at this time is to be accounted for by the want of knowledge of the anatomy of the parts which the physicians of those days were called upon to treat, and it is a notable fact that the progress in the study of this, as of all other affections, became possible only with the study of anatomy, which could be pursued with impunity only as late as the beginning of the 17th century, from which time new discoveries followed, step by step. The first disclosures of post mortum examinations revealed hard masses which were thought to be tubercles. In 1680 Silvius made the discovery that these tubercles or hard masses sometimes softened to form pus in their center. These tubercles he believed to be glands, and it was unfortunate for the progress of the correct knowledge of the disease that the difference between healthy and unhealthy glands was not clearly understood.

During the 18th century an advanced discovery was made by Mangetus, who described a case of general tuberculosis with dissemination of miliary tubercles, which he likened for the first time to millet seeds. These were found in the liver and spleen, kidneys, mesenteric glands and intestines. His description resembles that of perlsucht, or pearl disease of cattle of the present day. In 1783 it was believed by those who were regarded as advanced scientists that these little tubercles were the sole cause of phthisis or consumption. Morgagni, in 1761, thought phthisis arose from many causes, only one of which was tubercle, and when it originated from this cause he firmly contended that it was of a contagious nature.

The 18th century closes the second period in the history of tuberculosis. The 19th century furnishes the third period in the history of the disease, and from an historical standpoint the first quarter of this century is full of interest through the contributions of Bayle and Laënnec. Though there was between these contributions and those of their predecessors no lapse of time, in point of value they were centuries apart, and, based as they were upon individual observations without much reference to the past, they marked a distinct, separate, almost abrupt era in the history of the disease. The observations of Bayle regarding the nature of tubercles and the discoveries of Laënnec regarding the diagnosis of the disease did not seem to be based upon previous investigations, and hence are not gradual evolutions of previous views. The work of each was almost wholly original, so that their disclosures brought about a revolution in the study of the disease. Bayle in 1803 began his work with the distinct recognition of miliary tubercles, which he was the first thus to name. The larger forms, which attain the size of chestnuts, soften in their centers and are finally destroyed by suppuration. Translucent granulations the size of millet seeds and cartilaginous consistence, hence different from miliary tubercles, which are gray and opaque, produce the same ulcerations in underlying tissues, encountering the same structures in almost every organ of the body, especially in the larynx and trachea. He was not content to look upon them as accidents or curiosities. He saw in them the same characteristics and considered them as the real deposits of the same disease. The disease was therefore a general affection with various local expressions. Cachexia, a diathesis which he distinctly named the tuberculous, a diseased condition specific in its nature and independent of inflammation of the glands of the lymphatic system. Tuberculous phthisis is therefore not a disease produced by inflammation of the lungs, pleura, or bronchi. These affections may complicate it or precipitate a fatal end.

In these sentences are summed up a knowledge of the specific nature of tuberculosis, its distinct isolation from all other affections, and its existence as an independent disease. Had the succeeding pathologist been content to stand by the disclosures of Bayle, our present knowledge of the pathology of the disease might have been advanced a half a century.

The age of Laënnec has now arrived (1819). Bayle had described what might be called the dead facts of the disease; he had shown what tuberculosis really is.

An individual is affected with tuberculosis as soon as tubercles are present in the lungs. Bayle knew of no signs, however, by which the presence of the tubercles was detected in life. Not until pus was expectorated and hectic fever had set in could the disease be distinguished as yet, consequently Bayle took a hopeless view of the disease. Laënnec, on the other hand, discovered signs by which the presence of tubercles could be detected early in the complaint, and his view of the prognosis was far from encouraging. Laënnec commenced his work at the foundation. He began his work with the study of tubercles. He discussed his subject throughout from a clinical standpoint, paying close attention to all abnormal conditions of the breast. The fame of Laënnec rests, however, more especially and indisputably upon the discovery of auscultation, which at once outranked in value all other means of investigation. Auscultation is said to have been the creation of Laënnec, but percussion, which is also valuable in determining the condition of parts contained in the chest, was practiced since the time of Hippocrates.

Little was done with regard to the investigation of this disease from the early part of the century until about the middle of it, when Rokitansky, in 1842, taught that tuberculosis was the result of an exudation of coagulated albuminous compounds. A little later, Addison thought it originated from the white blood corpuscles. Lebert, about the same time, found a microscopical formation (neoplasm) which he believed was the sole cause of the disease. In 1847, Rheinhert fell back upon the old idea that tuberculosis was the result of chronic pneumonia. These theories were all eclipsed, however, by the famous Virchow, who, from his enviable rank and reputation as a scientist, had great weight in overthrowing all theories which had been advanced previous to his time, and his influence caused others to soon fall into his way of thinking. He declared that tuberculosis was a cheesy metamorphysis (change) resulting from an improper admixture of the blood which had previously been contaminated with different matters and which are apparently necessary to produce the peculiar condition. He also argued that tuberculosis had never been produced in animals experimentally and that it was never known in the fœtus. He also taught that it was hereditary, not by disease, however, but by disposition, and established the thought that youth was the age, above all others, when the individual might be considered as prone to the disorder. He studied the disease in quite an extended manner and recommended lines of treatment which became very popular, as they were thought to have a baneful effect upon the cause of the disease, and, in some instances, appeared to work a miraculous cure. Among other things, codliver oil became a very fashionable medicine with persons who were relapsing into a decline. Change of climate and a nutritious, easily digested food were also highly recommended by this savant, and his patients were warned against exposing themselves to influences through which they would be likely to take cold. He advanced his theories with such force, that they captured, so to speak, many eminent physicians.

Following him, came his pupil, Neimeyer, who was an enthusiastic exponent of his teacher's views. He, however, opposed heredity as being the cause of the complaint, but also admitted that the offspring of consumptive parents were likely to be affected with the disease. The congenital phase of the question, however, had not come up for discussion in this school.

Schroder Van Derkolk announced about this time that he was able to detect tuberculosis in the sputem by the presence of certain pus of an elastic nature.

Up to this time investigations had not been carried on, extensively at all events, with regard to the communicability of the disease from man to man, or even from man to the lower animals, notwithstanding that Laënnec accidentally inoculated himself in the finger while making a post mortem, which is reported to have disappeared, however, after frequent cauterizations, the first scientific investigations with regard to the communicability of the disease were pursued by the distinguished Villemin, who was the first to demonstrate that tuberculosis could be transmitted from man to animals. He inoculated rabbits and other animals subcutaneously and otherwise with tubercular matter derived from the miliary nodules and caseous tumors and even pustular products, and obtained identical results, thus showing a common cause in the production of various forms of the disease. These results were of such importance that they caused a radical departure from the then accepted views regarding the nature of this complaint, and were not accepted until the bitterest opponents of the theory were literally forced to accept the version of Villemin's results as being correct, and it is pleasing to note that these opponents eventually became the most loyal adherents to the new view and supported Villemin's work with considerable emphasis.

It was not long before such celebrated veterinarians as Chauvean (in 1868) took up the work and experimented upon ordinary domestic animals, including calves, sheep, hogs, dogs, and last but not least, horses, besides some of the smaller creatures, which were also affected.

The experiments concerning the communicability of this disease have been repeated and verified so often that it seems unnecessary for me to dwell upon that phase of the question. Were it deemed advisable, the most convincing experimental evidence could be produced here concerning the communicability of this disorder in various ways. In every-day life we have abundant, convincing proof reported, as clinical or bedside evidences of the communicability of tuberculosis. And statistical information convinces us in a most positive way that the disorder is spread from man to man and from man to animal, and *vice versa*, while personal observation has with equal force convinced the writer that it will spread through a herd of cattle in due time, providing the conditions are favorable.

After the contagious theory of this disease became established by scientific investigators, the ambitious ones soon began a search for the true cause of the peculiar material which produces such a disastrous effect upon the animal economy, but the progress of the investigation was rather slow, and it took about a decade before much advancement was made.

In 1878 Dr. Tapplin caused dogs to inhale powder produced by drying the sputum of consumptives, and he succeeded in producing the disease in some of the animals which he experimented upon.

In 1880 Conheim inoculated animals in the eye with tubercular virus and was able to note the progress of its growth, and after trying to produce similar effects with materials that were believed by many to be foreign to tuberculous matter, he eventually said, so far as tuberculosis is concerned: "Everything depends upon the virus, but the disease is still a riddle unsolved."

Klebbs in 1878, on investigating the disorder from the bacteriological standpoint, contended that he had isolated a micrococcus, but this was not proven to be the cause of the disorder in a manner that science could accept it.

In 1881, a bacillus as well as a micrococcus were blamed for causing the disorder, but the investigator was not sufficiently clear as to his methods to cause his assertions to be accepted by the bacteriological workers of the day, and it remained for the far-famed village physician of Germany, Dr. Robert Koch, to demonstrate to the world that he had made the greatest discovery of modern science, and his investigations, as has been already stated, were given to the world by the exposition of his classical treatise upon the subject in March, 1882.

With the foregoing brief sketch it may be well to close the history of this interesting complaint and pass on to some of its more practical features.

THE CAUSE.

The cause of tuberculosis has been shown to be a microscopic object called the Koch bacillus of tuberculosis, which has been most extensively studied by the far-famed professor, Robert Koch, in honor of whom the germ was named. He announced his discovery of the cause of this disease to the scientific world at Berlin in March, 1882, through a classical treatise upon the ætiology of tuberculosis, in which he showed the most extended and thorough study of the question. Since that time the micro-organism, which was claimed by Koch to be the sole factor in the production of this disease, has been studied by an army of workers in bacteriology, and although his statements were opposed by some, yet the opponents of his theory crumbled away one by one, until today it is questionable if there is an advanced bacteriologist who will dispute Koch's theory of the cause of the disease.

DISSEMINATION OF THE VIRUS.

In the present light of our knowledge of the cause of this disease it appears evident that the sources of infection demand close attention, for how can we ever hope to fulfill the prophecy of that savant, Pasteur, who has immortalized himself by his work, and who says in his discussions upon the cause of such diseases. "Man has it in his power to cause parasitic diseases to disappear off the surface of the globe, if, as we firmly believe, the doctrine of spontaneous generation is a delusion," if we do not block the avenues through which the virus gains access to the economy?

The avenues of infection open from various sources. First amongst them, let me speak of the sanitary surroundings of some of our most carefully guarded stock, for though singular as it may appear, it is amongst this class of animals that we oftenest meet with the disease, because they are housed in the most comfortable quarters, too often without sufficient sunlight or ventilation, and even when ventilation is permitted in all reasonable quantity, the greatest care is taken to prevent anything like a draught. The fresh air is required to come in on its tip toes, as it were, keep very quiet, and make its exit as quietly as it came in. As for sunlight, it is probable that it never gets into many cow stables directly, especially in those cases where the compartment is on the north side of the building. When the stable is more favorably situated, the windows may be small and too often covered with cobwebs or dust, or both. As far as our experience has gone, pure sunlight in a cow stable is usually the last thing thought of from a sanitary point of view.

It is well known to bacteriologists that direct sunlight has a most baneful effect upon the bacillus of tuberculosis, hence the advisability of having the stable so situated and arranged that the sun may have its full sway at all times. Indeed, the sunlight will not only have a baneful effect upon the germs of this disease, but it will have a salutary effect upon the constitutions of animals which are housed for lengthy periods, as they often are in northern latitudes.

Place a cow in the early stage of tuberculosis in a stable poorly lighted and indifferently ventilated, with a number of healthy cows. Under such conditions the diseased cow will most likely get worse, and will scatter the germs of her complaint right and left with her various excretions. This being of a contagious nature, is it to be wondered at that the other cattle will in time contract the disorder? It may take some time to develop the complaint in this way, but in the long winter months of our latitude valuable cattle are often housed, perhaps, more than is good for them, and there would be ample time as well as opportunity to contract the disorder. Looking then upon environment as an avenue of infection, it is hardly necessary to add that it may be blocked to a large extent by observing strict hygienic principles and keeping healthy and unhealthy animals separate from one another.

MANIPULATION OF THE FOOD AN AVENUE OF INFECTION.

In some well regulated establishments the food is occasionally handled in such a manner that it becomes an excellent vehicle for disseminating the disease, to wit: The cattle are all fed a certain amount of a certain ration at stated periods every day, and it often happens that one or two of them (varying as to individuals from day to day) will not eat it all up; that which remains is taken from the manger at a certain time after feeding and placed in a pile, where it is mixed with the next general ration to be fed out again at the next feeding hour, indiscriminately to one or all of the animals, and thus the disease may be handed in the most unsuspected manner from one cow to another. In this way valuable cows may be literally killed through mistaken economy by being required to eat such food as has been showered upon with disease-bearing sputum from their afflicted stable mates, and from one cow it gradually spreads through a large percentage, if not the entire herd.

Another avenue of infection, especially in the young, is the milk, for this may contain the germs of the disease in considerable numbers and yet the udder not be affected. This has been proven by numerous investigators, including Ernst of Boston, Smith & Kilbourne of the Bureau of Animal Industry, and a host of others too numerous to mention. Some are even alarming in their denunciation of milk as a source of tuberculosis amongst children. Prof. Law quotes Dr. Shakespear as saying "that one-fifth of all the diseases of infants and young children fed upon milk is due to tuberculosis." To help to determine the influence of diseased milk upon the animal economy, I have recently closed an experiment which indicates that it will produce disastrous results under favorable conditions. The details of the experiment will be published in a bulletin from the Michigan Experiment Station at an early date. Suffice it to say here that twenty gallons of milk were artificially infected with the germs of tuberculosis. This batch of milk was fed to three hogs for a period of four days, when it was all consumed. These hogs were placed in what I supposed to be a healthy pen. Immediately next to them, with only a board partition between, three other hogs were placed as controls. The latter three received the same general treatment as the former trio, but they did not get any of the diseased milk. After the four days had expired, the six animals were treated alike in every respect, as nearly as possible, the same man feeding them the same ration from day to day for several months. At a convenient time two of the three animals which were fed the diseased milk were slaughtered, and post mortum examination revealed general tuberculosis in both animals, the third one being kept alive for further study. The three controls were killed at the same time, and the most careful and rigid examination by Mr. C. E. Marshall and myself of all parts likely to be infected with the disease failed to discover a single suspicious lesion, and were consequently regarded by me as healthy animals. This experiment indicates that infected milk is dangerous, although only consumed a few times. It is, perhaps, unfortunate, as far as milk is concerned, that in the early stage of bacteriological investigations of this disease it was thought that as long as the udder was healthy the milk was safe, but we have volumes of experimental evidence at this time showing the contrary to be true, in other words, that the milk of a cow affected with tuberculosis may spread the disease to animals which partake of it, although the milk gland itself may not show evidence of disease. This suggests the advisability of Pasteurizing or sterilizing all suspected milk, if not all milk. Another avenue of infection comes through cattle licking their diseased stable mates, over which the diseased sputum of this disorder may be more or less distributed. When the disease comes through the avenue just suggested, the digestive organs and lymphatic system are oftenest affected. We frequently meet with this disease as affecting the lungs of cattle, and observation has led us to believe that the avenue of infection in these cases was through the air chambers, probably by inhaling dust from a recently-swept stable floor, or the dust of fodder which has been showered upon by cattle previously affected with the disease, or even the dried expectorations of a consumptive attendant. The fluid upon this fodder being permitted to dry by natural or ordinary circumstances, it is in a fit state to be inhaled when cattle toss it about with their muzzles, as they frequently do when searching for the more delicate morsels in the ration. Numerous intelligent breeders believe that bovine tuberculosis is hereditary, and even many scientists in their writings are not at all clear upon this phase of the disease. The confusion of the terms hereditary and congenital are no doubt responsible for our being sometimes misled as to these avenues of transmission. Even Fraenkel (p. 245), in his classical text-book upon bacteriology, if he is correctly translated by Linsley, mixes these terms in such a manner that if we are to accept his statements the germ theory of bovine tuberculosis is undermined, and, to use his own words, "at once falls to the ground." It is true that the author does not admit that tuberculosis may be an inherited disease, on the contrary he insists that it is not; though he does not undertake to prove it in his description of the disorder to which I have taken the liberty of referring.

For my own part, I believe that tuberculosis never was hereditary, is not now, and never will be. To demonstrate the grounds for this position we must first of all draw sharp lines between the meaning of the words *congenital* and *hereditary*, then we must go back to the very derivations of the terms and trace them step by step, until, figuratively speaking, we find the disease manifesting itself through symptoms in the living animal. The word congenital, according to the Etymological Dictionary by the Rev. W. W. Skeat, professor of Anglo-Saxon in the University of Cambridge, England, is derived from the Latin word *congenitus*, meaning *born with*. According to the Medical Dictionary of Dunglison, M. D., L. L. D., late professor of medicine and medical jurisprudence in the Jefferson Medical College of Philadelphia, it means *begotten with*, and here let me say that some importance of passing interest may be attached to the different meanings of the word given to it by the different authors. When, may I ask, is a creature begotten? or when is it born? If the solution of the problem were left to the writer, it would be said that a creature is begotten as soon as the spermatozöon of the male unites with the ovum of the female, and the process of reproduction commences; while the creature is born when it is brought into the outside world and breathes free oxygen; when, in the language of the bacteriologist, it becomes an obligative aërobe.

Now we may trace congenital tuberculosis in the mother to the ovaries and in the sire to the testes. The ovaries being the seat of the disease, it is not difficult to imagine the minute bacillus insinuating itself into the Graafian vesicle, and when the latter bursts at the time of menstruation the germ may easily be carried with the ovum into the fallopian tube, or womb itself; and in one or the other of these places and in company with the ovum, unites with a spermatozoon from the male, and if conditions are favorable the germ multiplies, while the new creature steadily grows, so that when the being is born it may at that time be already affected with the disease. That form of the complaint we interpret as congenital tuberculosis coming from the mother. On the other hand the testes of the male may be affected with the disease, so that when the minute bacilli of tuberculosis are liberated in them they may be readily carried by the spermatozoa, which are giants in comparative size, into the generative organs of the female, and there meeting with the ovule, the new (begotten) creature is inoculated, this time, though, from the male fruit of impregnation; constituting congenital tuberculosis coming from the sire. In this case the mother may give birth to her offspring laden with the germs of disease without ever having a vestige of the same complaint herself. We may go even beyond this, and trace bovine tuberculosis, or rather the germ of it, from the floor of the cow stable, carried up by the dust into the lungs, from an accidentally abraded surface of which it gains access to the current of blood, through which it is conveyed to the ovaries, or testes as the case may be, where under favorable conditions the evil consequences follow; and we have a well-developed case of congenital tuberculosis in the calf. In this instance might not the hereditarian say, upon finding the sire and dame healthy, "Here is a case where the disease has skipped a generation, or two if necessary, and through atavism or heredity the old family complaint has come to life again," when really the disease might have come from another animal of a different breed or race. To revert somewhat briefly to the word hereditary, let me say that it is derived from a Latin noun, *heres*, meaning an heir, the genitive case being used and suffix added to make up the word; it then evolves, when somewhat liberally translated, into the phase "pertaining to the heir of." Gould, in his famous dictionary of Biology and Allied Sciences, says it means "acquired by inheritance," and speaks of it as the transmission of physical or mental qualities or tendencies from parent to offspring, while the same author, in quoting Darwin's Theory of Heredity, supports the suggestion that each of the cells of the body gives off germinal particles, these when grouped constitute the generative cell, which in its turn is endowed with an inherent power to reproduce itself as well as the peculiarities of the original organism. But the Koch *bacillus* is an accidental invader of the cell of the economy; it is consequently a foreign body, just as much as a fine splinter of wood would be under certain circumstances, and has nothing whatever to do with the original constitution of that cell, therefore tuberculosis cannot be an hereditary disease. Another avenue of infection suggested by some is the placenta or after birth, it being contended that these membranes becoming affected from the mother are liable to communicate the disease to the young creature in utero, but looking at it from an anatomical standpoint, we are forced to the opinion that the placenta is far more likely to be infected from the fœtus (creature before it is born) than the fœtus from the placenta, for we must remember that the blood of the mother does not at any time come directly in contact or mingle with the blood of the fœtus, but that there are no less than two membranes to be penetrated, the wall of the blood vessel of the mother and the wall of the blood vessel of the placenta, before the germ can be conveyed to the fœtus in this way; while the communication from the fœtus to the placenta through the umbilical vessels is uninterrupted and continuous. We do not wish to infer, however, that the former method of infection is impossible or even improbable. By way of experiment, the blood has been shown to be an avenue of infection under what might, perhaps, be regarded as strained conditions; that is to say, the blood has been taken from the heart of an animal affected with general tuberculosis and injected into another susceptible animal. In the course of time the injected animal has broken down with tuberculosis.

As pointed out by many writers, wounds caused by mechanical appliances which are smeared with the germs of the disease and not thoroughly sterilized before being used, are responsible for some of the most unhappy results, some of which are noticed in another part of this report.

THE BREED OF CATTLE MOST LIKELY TO BE AFFECTED WITH TUBERCULOSIS.

An experience of over twenty years as a practicing veterinarian has led me to the conclusion that one breed of cattle is just as likely to be affected as another, and in my opinion very great injustice is often done to some, especially the Jersey, by the statement that they are more prone to tuberculosis than other breeds. This will be shown more clearly when I come to describe the tuberculin test, as I have applied it in this State. I have now under observation twelve head of cattle affected with tuberculosis composed of one Holstein, three Shorthorns, two Guernseys, onepolled Angus, three native grades and two Jerseys. Other breeds were not extensively represented in the herd from which the above were taken. I have seen it in the rugged Galloway, the Ayershire, the Hereford and many kinds of grades. The reason why I have not seen it in other breeds is probably because I have not had an extensive experience with them. I am firmly of the opinion that proper handling of cattle has more to do with their resistance against the germ of the disease than has the breed. This phase of the question may be discussed under the head of

INDIRECT CAUSES OF TUBERCULOSIS.

While it is now universally conceded that tuberculosis is due to a certain bacillus and without which the disease cannot exist, yet we must not ignore the fact that a weakened condition of the animal economy is favorable to the development of the germ, as the cells of the body have, to a greater or less extent, lost their power to fight against or resist invading germs, consequently the balance of power swings to their side, and, figuratively speaking, they sweep all before them. Again a weakened constitution seems to be a suitable soil or habitat for germs to grow in, and even the most superficial study of the question will readily convince us that suitable soil is just as necessary for the growth of disease producing germs, as it is for wheat germs or other familiar vegetable productions.

ILL-HEALTH AS A FACTOR IN THE INDIRECT CAUSE OF TUBERCULOSIS.

As far back as the year 1777 we find William Cullen saying that smallpox and measles often lay the foundation for tuberculosis, while there are few practitioners today but will admit that the debilitating influence of other diseases, acute or chronic, as the case may be, is often followed with an attack of consumption (tuberculosis). How often we are told on inquiring into the history of an individual case, that the animal had recently come a journey by freight and caught cold *en route*, or that it had more or less recently been exposed to a cold rain and chilled by it. I have often noticed the disease following closely upon the heels of parturition, while in other cases an acute bowel trouble may be the forerunner of the more serious complaint.

INBREEDING

is thought by many to be the indirect cause of tuberculosis; and, while I am ready to admit that under some circumstances it may be, yet I am still of the opinion that inbreeding from rugged and healthy animals will not produce offspring, on the average which may be regarded as being prone to tuberculosis. On the other hand, I am ready to admit that in inbreeding from parents with weak constitutions may result in the production of offspring which may be peculiarly susceptible to the disease.

BREEDING TOO YOUNG.

I am often asked the question by farmers and others if it is a dangerous practice to breed at too early an age, and invariably reply that I am of the opinion that it is not judicious, to say the least, to breed before the animal has come to maturity, for the reason that I believe it is asking too much of nature to develop two healthy creatures from the same economy at the same time. Such a practice would, in my opinion, if carried to the extreme, undermine the constitution of the mother in such a way that, if not disease, early decay would be the result.

IMPROPER AIR.

At one time air rendered impure by the breath of other animals was looked upon as being favorable to the propagation of tuberculosis, and it was thought by some to be the cause of the disorder. While it is certain that this cannot produce the disease at all, in the absence of the germ, yet it is such a potent accessory cause, when the bacillus is present, that its importance cannot be too highly appreciated. I have had this illustrated over and over again in this State where animals have been required, through mistaken kindness, to breath the vitiated air of warm stables in which they were housed to keep them comfortable in the cold days of a long winter.

DARK STALLS.

In very many instances we find dark and ill-ventilated stables going hand in hand. Such buildings are frequently filthy as far as their general surroundings are concerned. The darkness and filth, accompanied with foul air, is a good place for the development of the organism which causes this disorder. Besides being a favorable place for the development of the organism when it is present, the dark stalls which cattle are kept in month after month, will produce a change upon their economy which will debilitate them, having, it is believed by many, a direct action upon the blood globules which are influenced in such a way that they do not carry oxygen to all parts of the body in sufficient quantity to keep it in robust health; consequently we have a weakened constitution, prone to tuberculosis, in this case from the badly lighted or dark stable.

INSUFFICIENT OR UNWHOLESOME FOOD.

It is almost unnecessary to say that lack of food will debilitate the constitution of an animal and that indigestible or in-nutritious food will act in a similar manner; which may account for the half-starved creature being so often the victim of this disease. On the other hand, those animals which are fed on highly nutritious food, forced as it were, are also debilitated from a kind of indigestion, the result of food containing too much nutritious matter, more in fact than the body of the creature can assimilate or convert into the tissues forming its various organs, and in this way, we believe, the animal becomes within certain limits debilitated.

Overtaxing is thought by some to produce a certain degree of debility, such for instance as is sometimes resorted to in the dairy where the desire is to produce a record-breaking animal. Indeed the almost incessent strain upon the animal in such a case seems a feasible way to account for the presence of the disease in some of our most robust animals.

SYMPTOMS.

It is most unfortunate that this disease invades the economy of the animal in such a subtle manner that in many instances it has made extensive inroads upon the constitution before any extraordinary deviation from health is noticed. Recent experience has shown us that it makes considerable difference which avenue of infection the germs take to produce certain clinical symptoms by which it can be diagnosed, though clinical symptoms even in these cases must be accepted with some reserve, until figuratively speaking, there is time to run the material through the bacteriological mill. The writer's attention has more than once been called to cases diagnosed as tuberculosis in which microscopical examination, as well as other bacteriological methods showed the diseased condition to be the result of another cause. Sometimes the disease manifests itself in the beginning by an acute attack of diarrhœa which often appears considerably better after judicious treatment, when we are liable to congratulate ourselves that the case is doing nicely, only to be disappointed when some apparently trivial cause brings on a second and more acute attack. Things may go along in this unsatisfactory manner for some time, when sooner or later, the characteristic consumption begins, and the case goes from bad to worse and finally dies, an emaciated looking object. A case like the above is more likely to have derived its poison from the food, such as milk contaminated with the bacilli, or grass upon which these germs have been profusely showered with the discharges of an affected animal.

But the disease does not always take this rapid course through the alimentary canal. During the past year I have held post mortem examinations upon animal after animal and found a vast preponderance of the diseased lesions in the glandular or lymphatic system, which is the intermediate channel between the food and the blood, indicating that the germs found access to the body again through the food, but apparently finding a suitable habitat in this system seemed to be resting quietly while the host in its turn was growing fat. Indeed, it was difficult for me to form an opinion in many instances whether the animal would die from the disease or old age, if left to take its own course. No doubt such animals are the most dangerous to have about, for they may spread the germs right and left without ever being suspected of having the disease themselves, because they do not show symptoms by which it can be recognized through any known physical examination. Bacteriological examination might discover it, but in ordinary veterinary practice that would not be likely to be made. When the disease invades the economy through the organs of respiration by inhalation of bacilli which are floating in the disturbed air of say, a recently swept compartment, the floor of which has been bespattered with the discharges of a diseased animal, and allowed to dry, a very different state of affairs may be manifested. The germ, finding an abraded surface upon the lining of air tubes of the lungs, will very likely lodge there and form a colony which, in its turn, will in time, break up and scatter, forming many more colonies in the same lung or other parts; and this sort of thing may go on until there is enough of these foreign elements in the lungs to irritate them. Then the cough begins, followed sooner or later by loss of flesh. Nothing the animal eats seems to do it any good; in fact it loses weight from day to day, typical consumption having set in which only needs time to wipe out the existence of the creature.

All the living or organic tissues of the body are liable to be affected with this disorder and of course the symptoms vary somewhat according to the organ or part affected. When the brain, for instance, is the seat of the attack then a variety of nervous symptoms will manifest themselves according to the part of that organ affected. If, for instance, the part supplying vision becomes diseased, then paralysis of the nerve of special sense of sight may be brought about and the animal become blind. In a similar manner the animal may become deaf, or the sense of taste or smell may be deranged. In other instances that part of the brain which controls the voluntary movements of the body becomes affected and the creature moves about, if it moves at all, in the most eccentric manner; truly it is unbalanced. When any part of the spinal cord becomes affected the symptoms vary from partial to complete loss of motion or loss of sensation, or both. When the generative organs of the female become involved to a very large extent she will not breed with certainty. I have seen cases where the womb was so distorted by disease that it could hardly be recognized. Indeed, the same might be said of any other organ in the body.

Again, tuberculosis appears under two heads—the acute and the chronic. The first may run its course in an incredibly short time and is then spoken of as galloping consumption, and even the chronic variety will sometimes become suddenly acute, when the closing scene of the disease approaches with extraordinary rapidity, after perhaps a lingering illness of many months or even years. At the outset of the disease, either acute or chronic, the lesions may be confined to one organ or region of the body, therefore the symptoms vary considerably. In many chronic cases the tubercules are confined to such parts as the liver, spleen, pancreas or lymphatic glands; in which case the animal may live and thrive for an indefinite period.

One of the most remarkable cases of this description was brought to my notice upwards of twenty years ago, a history of which may prove of interest to many, and serve as an example of how the disease may and does behave itself. The history was as follows:

An animal in a high class shorthorn herd, which I had under my veterinary supervision, one day refused her feed and coughed a little. The foreman of the establishment reported the case to me forthwith. I visited the creature and after making an ordinary physical examination of her, suggested to the man that she might have taken cold and treated her accordingly. The following day I visited her again and upon making further examination of her condition was somewhat surprised to find evidence of heart disease. She being in very high condition, I thought possibly I had a case of fatty degeneration of that organ to deal with. But that did not account for the cough which was of a most intractable nature; so I stated to the owner that I was afraid his animal was affected with consumption, and advised him to dispose of her before much expense had been consumed in treatment, which I was afraid would be of little, if any avail. He stated that the cow was a very valuable animal, worth many hundreds of dollars on account of her pedigree, but added that he would act according to my recommendation. I said to him perhaps it would be better to wait for a few days, in case I might be mistaken, and as far as I could see, there was no immediate hurry in the case. This being agreed to, I kept a close watch upon the creature for about a week or ten days, during which time I could not see that there was any abatement in the symptoms. It may be here remarked that this case occurred many years before the true nature of this disease was known. I mention this because today I would almost regard the recommendation I made as being criminal, to-wit: I stated to the owner after the ten days had expired that I thought it would be more profitable for him to kill the animal and sell his carcass for beef. He requested me to so direct his foreman, which I did, and further requested him to preserve the heart and lungs and various offal. To make a long story short, in the course of two or three days, the foreman reported to me that he had preserved the lungs and other offal for my inspection, but that he could not find the heart. Although I was at first surprised at his statement, yet when I came to examine the parts I was not, for the entire pericardial sack was a mass of tubercular matter, enveloping the heart in such a manner that no layman would ever suspect the presence or existence of that organ from external appearances. The tubercular matter formed a case around the heart, the walls of which were at least two or three inches thick on the average. When cut down upon this case was composed of the cheesy matter so characteristic of long standing tuberculosis. This condition of things readily accounted for the symptoms of heart disease, which I recognized the day after my first examination, and to which I have already alluded. Besides this there were groups of miliary tubercules in every direction about the lungs, which organs were also the seat of extensive disease. Passing out of the chest and reaching that cavity which contains the bowels and kidneys I found these organs also badly affected. The space usually occupied by what the housewife calls the suet, was nothing but a mass of tubercules and the glands of the bowels were very seriously affected with the same disease. Indeed, this was such an advanced stage of general tuberculosis that I began to doubt whether I had received an accurate history of the case from the foreman, and proceeded to question him somewhat closely as to how long the cow had been ailing before she was reported to me. I was assured most positively by him that the animal had never refused a feed in her life until the day she was reported to me. Knowing how particular they were on this farm to have all cases of disease reported at my headquarters as soon as they manifested themselves by symptoms, I had no doubt but that the truth was told. Since that time I have met with many cases similar, though perhaps not as bad as the above, which have convinced me most emphatically that tuberculosis can invade the economy of an animal most extensively and yet the disease cannot be diagnosed by physical examination. During the past two years I have had this conviction very firmly substantiated through the application of the tuberculin test, where I have found scores and scores of the most vigorous, sleek, and healthy looking animals loaded with pounds and pounds of advanced tubercular matter. I mention this at this time to impress upon the reader the value and importance of the tuberculin test, to be described later.

We will now pass on to the symptoms of the disease when it attacks individual organs.

TUBERCULOSIS OF THE LUNGS.

The disease may attack these organs in the acute or chronic form. When the acute form occurs the animal may be noticed to be off its feed, its coat will stare, the skin will appear hide-bound, it will be tucked up, more or less, in the flank, refuse to eat even the most delicate morsels, will breathe with more or less rapidity; cough is usually present and can be often excited upon slightest provocation. Percussion upon the walls of the chest will cause the animal to evince more or less inconvenience. The eyes may be sunken and a profuse discharge of tears may emanate from them. General prostration is a usual accompaniment of the disorder in these cases, and the animal becomes much debilitated in consequence.

Things go from bad to worse until in the course of a few days she will appear an abject, loathsome looking object, staggering in her gait and ready to fall at any moment. The tottering gait is a common signal of the approach of the closing scene of the disease, and nature usually puts an end to the unfortunate creature's sufferings within a few hours. As far as my experience has gone the acute form is rather the exception than the rule. In the chronic form the disorder is insidious in its progress. The appetite will often be capricious, the animal partaking somewhat lustily of her food one day and refusing it perhaps altogether, or eat it daintily the next. She will give an occasional cough which is not unusually regarded as being of a serious nature, and may be accounted for by the herdsman saying "Some dust has gotten into her throat," or something of that kind. If we were fortunate enough to collect some of the sputum during these paroxysms of coughing we might be able to diagnose the disease positively with the aid of microscope. I have done so on some occasions by finding the germ. But we must not allow ourselves to be misled by such an examination, because our inability to find the germ does not prove that it does not exist in the economy of the animal, while its presence does prove the existence of the disease. As time progresses the cow may not thrive as well as its neighbors although even at this advanced stage of the disease the symptoms are still negative. Later on, however, the cough will appear to be getting worse and the herdsman is likely to say that such and such a cow "catches cold on the slightest provocation," because for two or three days she will appear as if suffering from an acute cold, when, in the course of time, the atmosphere and other surroundings being conducive to good health she will appear better, but again relapse into her former unsatisfactory condition upon the slightest provocation. After a time, as the disease becomes still farther advanced, more positive symptoms present themselves. The cough gets worse, her breath frequently has a foul odor; she cannot endure fatigue in the shape of driving to the pasture field, for instance; her appetite becomes more and more capricious and dainty; she will soon begin to shrink—typical consumption having set in, when she will go down and down, and eventually die an emaciated, pitiable looking object.

During the progress of the disease through the lungs, the human physician in his practice, has the advantage of being able to determine, even in the earlier stages of the complaint, that something is radically wrong with them, and the impressions which are conveyed to his ear through auscultation are so characteristic of tuberculosis that he can diagnose it with reasonable, though not by any means positive, certainty. But the veterinarian is handicapped in many ways, so that to him auscultation is not of nearly so much benefit in diagnosing this disorder. In the first place, the difficulty of keeping the animal quiet while the operation is being performed, then the thick skin, or thick muscles, and often the thick layers of fat will prevent his ear from detecting certain sounds or rather the absence of certain sounds. Again, the rumbling of gas in the bowels and rumen will often defeat his efforts. But supposing he does determine that the lungs are diseased? Experience has no doubt taught him that he is not justified in proclaiming it a case of tuberculosis at once, for we have other disorders which produce similar ante-mortem symptoms, notably actinomycosis, parasites in the lungs, or chronic pneumonia, with perhaps other conditions which I have not investigated.

In the chonic form of tuberculosis of the lungs, the eyes assume the same general appearance that they do in the acute form, that is to say, they present a glassy appearance, they are sunken into the orbital sockets, and frequently surrounded with a profuse discharge of tears, giving them what is commonly called a watery look.

TUBERCULOSIS OF THE HEART.

While the muscular tissue of the heart itself is not often involved in tuberculosis, so far as my experience has gone, yet the membrane (pericardium) covering it is occasionally attacked. Of course the symptoms are more or less remote, and at best are not diagnostic. All that we can say in cases of this kind is that the intermittent pulse is indicative of disturbance of this organ, while the inability of the animal to stand fatigue without some good reason, might perhaps, still further arouse our suspicions as to heart disease. This occurring in a herd sprinkled with the complaint, we might naturally regard the deviation from health as being alarmingly suspicious, to say the least of it.

TUBERCULOSIS OF THE STOMACH.

In cases of this description the organ may in some cases be able to perform its function fairly well, but in such a complex organ as the stomach of the ox, it is more or less difficult to describe the disorder in a manner that would be comprehended by the average reader. Certain characteristic features, however, do accompany the disease which suggest to the ordinary observer, that the stomach was affected with some occult disease. In many animals the appetite becomes impaired, evidenced by its irregularity, rumination is not performed in a satisfactory manner and the herdsman may complain that such and such an animal loses her cud frequently. When the first compartment of the stomach, namely the rumen, is affected, the cow will in all probability, be a victim to tympanites and, as a consequence will bloat upon almost any kind of food. If the fourth compartment or true digestive portion is affected the symptoms will vary according to the severity of the attack and in extreme cases the animal may be afflicted with exasperating pains, but in cases of this description the symptoms are surrounded with so much uncertainty that it is accepting a good deal of responsibility, and perhaps jeopardizing one's professional reputation to diagnose tuberculosis of the fourth stomach in anything like a positive manner, without the aid of tuberculin.

When the bowels and their associated glands are diseased, the symptoms are well marked and even regarded by many as diagnostic, that is to say, the animal will be affected with a disturbed condition of these organs, frequently breaking down into an acute attack of diarrhœa. This will yield to treatment at times, but will return with increased severity on slight provocation, which second attack cannot be overcome. In the case of valuable animals, careful feeding with judicious management will keep the disease in abeyance for a considerable length of time. But notwithstanding this, the progress of the disorder will, as a rule, keep making dire inroads upon the constitution, until the army of invading germs hold the balance of power firmly in their clutches. When this state of things has been reached it does not take long to decide the battle, the afflicted creature will run down very rapidly, and like her neighbor who was perhaps, affected with the disease in her lungs, will die a loathsome, emaciated looking object. A case like this is technically called tabes mesenterica.

TUBERCULOSIS OF THE ACCESSORY ORGANS OF DIGESTION—LIVER, SPLEEN, PANCREAS.

The liver of animals, as far as my experience has gone, is oftener affected with tuberculosis than either of the other accessory organs of digestion. I have seen it quite badly diseased without being able to recognize the complaint ante-mortem. In some instances the disturbed condition of this gland will manifest itself by such symptoms as an occasional attack of jaundice and certain indefinite symptoms of ill-health will often accompany the disorder.

The pancreas and spleen are occasionally affected, but the symptoms which they produce, if, indeed, they produce any at all, are so obscure that I have not been able to recognize the deviation from health which would point to their being affected with this complaint. It is as a rule only when the disorder is generalized that these organs are affected; at least, that has been my experience; but it must be added that it has only been on post-mortem examination that I have discovered them diseased.

TUBERCULOSIS OF THE KIDNEYS.

Tuberculosis of the kidneys may in aggravated cases produce distressing symptoms; the loins may be sensitive, and manipulation of them will cause the animal to evince considerable pain, pinching or pressure upon them causing the creature to wince in an irritated manner. The discharges from the glands may be frequently discolored or mixed with blood or matter or both. Microscopical examination of the discharge may reveal the presence of the bacilli of tuberculosis and thus a positive diagnosis of the complaint may be made.

TUBERCULOSIS OF THE LYMPHATIC SYSTEM.

Tuberculosis of the lymphatic system is very often unsatisfactory from a variety of standpoints. In the first place it is not always easy to diagnose it, while in other instances, when we do diagnose it, the treatment is most unsatisfactory, but notwithstanding, we should make ourselves acquainted with the symptoms of the disorder when affecting this system. I have found glands at the root of the ear swollen to a considerable extent and upon removing them they were loaded with the caseous matter of tuberculosis. The submaxillary glands, situated behind the branches of the lower jaw, and about the angle of the same, are difficult to feel when healthy, but when affected with tuberculosis they swell up to a greater or less extent and sometimes burst, or if cut down upon will be found containing cheesy material. In cases of this description the disease may be easily confounded with actinomycosis and it will sometimes require bacteriological methods to distinguish between the two.

TUBERCULOSIS OF THE THROAT.

We sometimes find the glands situated above and behind the posterior openings of the nose affected in such a manner that they increase enormously in size, large abscesses forming which block up the air passages to a certain extent causing the animal to breathe at first, perhaps, with a wheezing noise; afterwards it becomes loud and snoring. Cases of this kind have been brought under our notice when the animal was threatened with suffocation if she attempted to graze from the ground or depress the head unduly. When, however, such an animal would elevate her muzzle she would breathe with comparative ease. This I have accounted for by the fact that these tumors are loose in their connection with surrounding tissues, and are thus possessed of considerable freedom of motion; so much so that when the head is in a favorable attitude, as it is when held high, they drop back and thus permit the air to pass through fairly well, while when the head of such an animal is depressed the enormous tumors will naturally gravitate towards the ground and by so doing will drop, so to speak, into the posterior openings of the nasal chambers and block them to some extent. In aggravated cases of this description there will be more or less difficulty in swallowing and frequently a ropy saliva will drool from the mouth. It is not at all uncommon to find cases of this description accompanied with persistent paroxysmal cough, which indicates tuberculosis of the larynx (organ of voice).

GLANDS IN FRONT OF THE SHOULDER.

This system or group is situated in front of the middle of the shoulder blade and can be recognized by a swelling which will usually have a nodular feeling. I have met with cases where the enlargement in this region was comparatively enormous, one case that I can call to mind being as much as a foot long and say four inches in diameter, and oval in shape. This enormous tumor when cut down upon contained a large quantity, say a pint, of liquid, gelatinous pus. I may add to this, that on post mortem examination I found general tuberculosis of the animal, which creature was in the pink of condition and doing well, from the feeding standpoint, before it was killed. I merely mention this as another illustration of where tuberculosis can make extensive inroads upon the constitution of an animal without apparently causing it any inconvenience. But enlargement in this region can only be looked upon with suspicion.

GLANDS IN THE NEIGHBORHOOD OF THE STIFLE JOINT.

We sometimes find nodular excrescences situated in the neighborhood of this joint, occasionally reminding us of several peas or hazlenuts for instance, which can be moved about within certain limits in various directions. The surface which is affected with these little round lumps sometimes occupies considerable space around and about the joint, or, indeed, they may enlarge to the same extent as the case just mentioned, where the glands in front of the shoulder were at fault.

INGUINAL GLANDS.

In a general way the glands in this region are affected in about the same manner as those in front of the stifle.

THE POSTERIOR CERVICAL GLANDS.

Situated in the groove, occasionally called the jugular gutter, which is a channel that passes down the neck in close proximity to, but behind and above the wind-pipe. The symptoms when these glands are affected, are, in a general way, the same as when other glands upon the external surface of the body are the seat of the disease.

GLANDS ON THE INSIDE OF THE CHEST.

Situated between the lungs is a chain of lymphatic glands and vessels which, in the writer's experience, have been affected with tuberculosis in a greater percentage of cases than have the glands or tissues of any other single region of the body. These are called mediastinal glands.

In close proximity to these are the bronchial glands, which, however, to be more exact, are situated about the primary divisions of the wind-pipe into right and left branches. They are also often affected with tuberculosis. While these glands are within the chest, disease of them must not be associated with tuberculosis of the lungs themselves in as much as they do not enter into the composition of these organs. So far as the bronchial glands are concerned there is no method by which disease of them can be recognized that is known to the writer. With the mediastinal glands, however, I have met with cases which were associated with prominent symptoms which might raise our suspicions. One case occurred in an animal which was frequently affected with tympanites of the rumen, and had more or less chronic difficulty with the act of deglutition (swallowing). This animal was eventually killed and I had an opportunity of investigating the case and determining what was the cause of the peculiar ante-mortem symptoms. I was gratified to find sufficient evidence to account for the deviation from health in as much as I found tuberculosis associated with the mediastinal glands to an almost incredible extent, they being enlarged beyond all possibility of recognition, being increased in size by the formation of abscesses containing pus and caseous (cheesy) matter until they had assumed such enormous proportions that they pressed upon the œsophagus (gullet) no doubt to a slight extent all the time, probably to a greater extent at certain periods, notably when the position of the body was such as to cause them to press with more force at one time than another. It is needless to say that this pressure upon the gullet would account for the symptoms of difficult deglutition, but it may not be known to the general reader that obstruction to the œsophagus will invariably cause distention of the first stomach with gas (tympanites). Those who have seen an animal choke on a potato or something else have no doubt noticed the bloating which invariably accompanies the accident.

TUBERCULOSIS OF THE WOMB AND OVARIES.

These and their surrounding membranes are often implicated in general tuberculosis. I have seen cases where the former was so distorted by the disease, thickening its walls to that extent that it could not be recognized by an ordinary observer, and would remind one upon feeling it of a hard rubber mass. On making a section of it the macroscopical (with the unaided eye) appearance of tuberculosis was very plain. With regard to the latter they are sometimes diseased so much that they will not perform their functions and animals affected with the disease in these organs are often permanently barren; although it is possible for them to be diseased in a modified form and yet the animal be fertile.

TUBERCULOSIS OF THE UDDER.

When the disease attacks this gland, or rather these glands, for there are four of them, the symptoms and lesions will vary considerably in individual cases so that anything like a description can only be given in the most general terms. A portion of one quarter may be affected or perhaps the entire gland. As it so often attacks a portion of the gland let me say that such cases will usually be accompanied with a circumscribed swelling which may be, we will say for convenience sake, the size of a hen's egg, being harder than the rest of the gland; but this hard lump need not be painful as might be expected. It will undergo various changes which are peculiar to tuberculosis; notably it will occasionally suppurate when pus may be discharged into the lactiferous ducts and will be drawn from the gland with the milk. In cases like this the poison of the disease is disseminated from an unsuspected animal most profusely. It is more or less unfortunate in connection with tumors of these glands that we cannot tell with certainty from ordinary clinical examination whether they are caused by the bacillus of tuberculosis or perhaps some less harmful organism, without resorting to bacteriological methods. To those who are familiar with the pathological changes which occur in the tissues affected with tuberculosis, macroscopical examination will enable them in many instances to differentiate with tolerable certainty between it and some other diseases. It is well known to veterinarians that the germ of contagious mammitis causes a certain amount of tumefaction of the udder which might easily be mistaken for tubeculosis by the casual observer or *vice versa*. In other instances all of the glands forming the udder may be affected with the disease in any or all of its stages.

TUBERCULOSIS OF THE BONES.

This is an interesting condition which occasionally occurs in young animals. It is said to have been produced experimentally . The bones most often affected are those entering into the formation of such joints as the knee, hock, elbow and stifle. The portion of the individual bone which is usually affected is the delicate frame-work situated in the interior and called the cancellated tissue, which becomes red and congested to be followed by a fatty, caseated appearance; the animal in the meantime becoming very lame and at times unable to rise. In extreme cases the bone has been known to crumble away and sharp speculæ of it protrude through the skin.

TUBERCULOSIS OF THE JOINTS.

In cases of this description the disease generally begins in the lining membrane of them, and may form fungus-like growths extending even into the bone. The joints will become more or less enlarged and the animal will be very lame. Cases like this are sometimes attributed to rheumatism by the layman.

TUBERCULOSIS OF OTHER ANIMALS.

While tuberculosis is found affecting various domestic animals, and many wild ones, yet, according to the writer's experience, it is oftenest met with in cattle, next hogs, then horses, after which come sheep and goats. Of the carnivorous animals dogs and cats are quite often affected. Not only does it attack ordinary domestic animals, but we have well authenticated cases in the various animals of the zoological gardens and menageries, as well as fowls and birds of many kinds.

TUBERCULOSIS OF THE HORSE.

I have rarely recognized the disease as affecting this class of animal, but a description of one well marked case which came under my observation in this State will answer as a typical case.

The horse was reported to me as affected with glanders. Upon visiting the animal I was not long in deciding that I had something else to deal with besides glanders, and asked the owner as to the previous history of the creature. He informed me that the horse, as might be supposed, often changed hands, but had been in his possession for a number of months. The former owner stated to him when he purchased the animal that it had only a cold but would soon recover. And the man's statement, within certain limits, was true, for it happened that the balmy days of early summer soon set in. The horse was kept out of doors most of the time and the return to health was remarkable. While it was true that the animal never got entirely well, yet it was so much improved that the person who owned it at the time of my examination thought it would eventually recover entirely. As soon as the weather became unfavorable, as it did in the fall, the horse began to lose ground again, and to make a long story short, was soon reduced to little more than skin and bones. It had a profuse discharge from the nostrils and the deep hollow cough, which so often accompanies this disease, was present in a marked manner and could be easily provoked at any time by requiring the animal to move sharply. The cough, as I observed it, was always accompanied with profuse expectoration. The absence of the various symptoms of glanders, together with the peculiar cough, history, emaciation, etc., caused me to diagnose the case as one of tuberculosis. I was enabled to verify my opinion the next day for it was decided to dispose of the animal in a somewhat summary manner, which gave me an opportunity of holding a post mortem upon it, after which I was fully convinced as to the correctness of my previous diagnosis.

This disease is stated by Prof. Bang to be of quite frequent occurrence in Denmark, and he accounts for its frequent appearance there by the fact that horses in that country are often fed upon skim milk. In writing upon the subject that author says: "Tuberculosis in horses is not rare in Denmark, doubtless because of the extensive use of milk in fattening young ones intended for market. This usually appears as feeding tuberculosis, with intestinal ulcers and very large deposits in the mesenteric glands, sometimes also in the peripharyngeal glands (glands of the throat) and with secondary deposits in the lungs."

Nocard, a French authority, on the other hand, writing of this disease, says that tuberculosis is comparatively rare in the horse. Nevertheless, during the past fifteen years, a sufficient number of instances of it have been published to enable one to attempt to describe the principal forms it assumes.

In the horse the disease may be localized either in the organs of the abdominal cavity or in those of the thoracic cavity. It begins sometimes in the former, sometimes in the latter, then becomes general, but most frequently it is by means of the digestive tract that the infection finds its entrance. Curiously enough all the cases hitherto observed have been isolated ones, in spite of the fact that the affected animal, as a rule, belonged to a large stable. The explanation of this appears to be, firstly, that the lesions usually develop first in the organs of the abdominal cavity, the lung being next attacked; but at a later stage. The horse being no longer fit for work it is soon killed. The tubercular horse rapidly becomes unfit for ordinary duties so that pulmonary lesions, when present, have not time to undergo the softening necessary to produce the nasal discharge or virulent expectoration which constitutes the most potent agents of infection.

Although it is certain that the intestinal tract is the principal entrance gate for the bacillus, nothing precisely is known as to the origin of the contagion. Lehnart has published an interesting case of a foal which became tuberculous as the result of a long stay in a stable with some phthisical (consumptive) cows.

LESIONS.

Nocard further says in substance: The lesions which are found at the autopsy of a tuberculous horse are usually very different from those we have studied in the cow and pig. Most frequently, as we have said, the disease begins in the organs of the abdominal cavity,—it attacks the glands, especially the spleen and the liver, the peritoneum and intestines being sometimes affected. The lung is, as a rule, attacked secondly. In opening the abdomen a variable quantity of yellowish, transparent or reddish liquid always flows out. The peritoneum (lining membrane of the abdominal cavity) is sometimes studded with firm, gray or whitish, rounded tumors, about the size of a millet seed, pea, or the hazelnut. The glands beneath the lungs are sometimes enormously enlarged, the tumor being irregular and knobby and presents on section a smooth, succulent, white surface, crossed by gray veins, which is sometimes uniformly tough and resistant, but more frequently softened and caseous in places. The glands of the border of the intestines are generally very large and white or grayish pink in color, sometimes homogeneous, succulent and firm, sometimes completely caseous. The spleen is generally enormous and enlarged in all its dimensions. It is stuffed with round, white, firm, succulent, caseous tumors of a size varying from that of the hazelnut to that of an apple. Its tissue is firm and when it is cut into the minute structures forming it are greatly enlarged, being as big as peas, and their pale pink color shows up well against the brown-red background of the organ. The liver is always very large and is sometimes infiltrated with tumors like those of the spleen. On section the surface is often seen to be crossed by delicate, grayish white veins which define the lobulations of the organ very distinctly. The intestines are fairly often the seat of important lesions which are especially found in the glands of that portion called the ilium, especially Peyer's patches. Sometimes the lesions consist of actual thick tumors which are flabby and red and have a fairly smooth surface. Sometimes the tumors are ulcerated and contain a yellowish or blackish, fetid pulpy material. Sometimes there only exists at the site of the patch an ulcer the depth of which is increased by the thickening of the mucous membrane at this periphery. The lung is always infiltrated by lesions which are obviously more recent than those of the abdominal organs. This is very large and heavy; notwithstanding it floats in water. When cut it gives the sensation of a tough, slightly indurated tissue. The cut surface has the following appearance: On the uniformly vivid red background appear a multitude of dirty white markings which are irregular and branching and anastomose, so as to give the organ an irregular lobulation; this abnormal new tissue is homogeneous and has the same general appearance throughout the whole of its depths; in no part of it are there nodules with tough, fibrous walls or cavities or foci of softening; and, in fact one would say that it consisted of irregularly distributed patches of infiltration, of the interlobular and coated tissue. All these lesions are extremely rich in specific bacilli, which always seems to be a little longer than in other animals. We have seen, however, that inoculation in the guinea pig and cultures show that they are identical with those met with in other mammalia.

Sometimes the disease begins in the lung and the lesions are then very variable. Sometimes they consist of rounded nodosites as big as a hemp seed, a pea or a hazelnut, distributed with a fair amount of regularity throughout the substance of the organ. These small tumors are composed of collections of soft, caseous material, very rich in bacilli, surrounded by thick, tough, fibrous walls. At other times the lesions resemble sarcomatous growths generalized throughout the lung. These growths are white, tough, homogeneous throughout, devoid of areas of softening, of a size varying from that of the hazelnut to that of a walnut or pigeon's egg, and do not appear to irritate the pulmonary tissue which preserves its normal appearance in their immediate neighborhood. They consist of collections of a greater number of tuberculous follicles, have no tendency to caseation, and very rich in giant cells and very poor in bacilli. Lastly, the disease sometimes consists of a more or less extensive caseous pneumonia with bronchial dilatations and cavities as the result of progressive softening of the caseous tissue. In all these cases the bronchial glands are attacked early. They are hypertrophied (enlarged) and either stuffed with miliary nodules or, as is more frequent, caseous and softened. Sometimes also the pleura and pericardium (covering of the heart) are attacked by more or less severe tuberculous lesions. These lesions consist either of miliary nodules which are isolated in clusters greyish or whitish, rather tough, and always small or else of a considerable thickening of serous membrane which seems to have undergone utter caseous infiltration. There may be also found variable lesions of the lymphatic glands, of the uterus of the mammæ, etc. In addition, ulcerations of the bronchi, of the trachea, of the larynx, and even of the nasal cavities have been discovered. It is important to note that tuberculous lesions of the horse very rarely become calcified.

SYMPTOMS.

"The predominating symptom in most of the cases that have been observed has been inability to work at a time when nothing else in the general state of the animal seemed to indicate that it was ill. It is quickly out of breath, and on the least effort being required of it soon stops and with heaving flanks, head extended, and nostrils dilated, and limbs trembling, it refuses to go on. The most careful examination of the system fails to discover any lesion capable of explaining this loss of power. Soon rapid wasting supervenes in spite of a fair appetite and good food; at the same time profuse polyuria (profuse discharge of urine) comes on and persists for several weeks, playing an important part in the rapid wasting of the subject. Not only is the quantity of the fluid excreted increased to double, triple, or quadruple the normal, but changes in its composition also take place. The proportion of uria is greatly increased. Uric acid which is normally absent, is found in relatively large amounts, while hippuric, usually so abundant, is present in very small amounts or absent altogether. Briefly, the appearance of the tuberculous horse is that of an animal which is consuming its own flesh. Polyuria is recorded in all the cases described by Nocard.

All these signs become rapidly pronounced. The animal falls into a state of marasmus. It is only able to stagger along. Its appetite becomes capricious and fails altogether. The fever becomes constant, the temperature often being higher in the morning than in the evening, and hardly ever rising more than one or one and one-half degrees above normal. At this period the quantity of urine excreted may become normal, and it sometimes contains a small quantity of albumen. At this period, also, auscultation reveals some harshness of the vesicular murmur, which is, however, everywhere retained, and sometimes here and there a little crepitation at the end of respiration. The resonance on percussion is everywhere normal or very slightly diminished. The heart may show slight functional disorder; the first sound is duller and sometimes reduplicated, the second sound is sharp and more distinct. From time to time a slight pulsation in the veins shows the difficulty which the ventricle has in driving forth the blood which distends it. There is nothing very significant, in fact, about any of these symptoms. Towards the close of the disease congestion of the lungs and profuse diarrhœa may intervene. All these signs are especially noticed in abdominal tuberculosis, which is the most common form of the disease and has been most studied. Rectal examination often increases the probability of the diagnosis, by revealing the presence of the bulky tumor in the sub-lumbar region. In the pulmonary form of the disease a cough is nearly always present, which is nearly always short, dry and paroxysmal. The cough is usually accompanied by a small amount of mucuous discharge from the nostrils. This discharge is seldom abundant or purulent, since for that to occur the pulmonary lesions must undergo caseous softening and become transformed into actual cavities communicating with the bronchia. Excepting in very rare cases where this latter occurrence has taken place, the examination of the lung gives but little more information than it does at a late stage of abdominal tuberculosis. However, when the pleura is attacked a more or less copious effusion may take place which will reveal itself by the ordinary signs of hydrothorax. There have also been described repeated nasal hemorrhages and specific congestions of the external glands, such as the sub-glossary, parotidean, etc."

DIAGNOSIS.

"Diagnosis of tuberculosis of the horse does not seem very difficult. Five times I have been able to make the exact diagnosis of abdominal tuberculosis. The feebleness, the shortness of breath, the progressive wasting, the condition of the urine, and the finding of the bulky tumor in the sub-lumbar vault are characteristic. In the pulmonary form the cough does not constitute so imporant a sign as the sub-lumbar tumor in the abdominal form, but if there is any discharge from the nostrils the microscopic examination and inoculation of it will enable one to make a certain diagnosis of it readily enough. Lastly, injection of tuberculin is of greatest use in doubtful cases."

Tuberculosis affecting the hog has been described in another part of this report.

TUBERCULOSIS IN THE SHEEP AND GOAT.

These animals appear to be very refractory to the germ of this disease, having been reported as resisting sub-cutaneous inoculation; but it has been produced by injecting the poison into the veins. The repeated injection of tuberculous material rich in bacilli also succeeds in infecting them. It is more or less difficult to diagnose the disease in sheep, there being other complaints which produce similar symptoms; certain kinds of worms in the lungs will cause an aggravating cough, which to some extent resembles the cough of tuberculosis. In this State I have examined animals affected with a certain form of lung worm which even the post mortem examination might easily lead the casual observer to suspect tuberculosis. So in this animal it is risky to form an opinion without microscopic if not extended bacteriological investigation. Characteristic lesions of tuberculosis upon the pleura and in various parts of the abdominal cavity would justify one in forming an opinion in some instances should such lesions be present in a marked manner.

TUBERCULOSIS OF THE DOG AND CAT.

In those cases that have been brought under my notice, general emaciation, inability to stand fatigue, persistent cough accompanied with remittent periods of apparent convalescence have been the most marked feature of the disease.

TUBERCULOSIS IN BIRDS.

Few people in this country have given much attention to the disorder as affecting this class of animals, and consequently pet birds may literally be the hot-bed of a disease which will cause sickness and death to the owners of these animals, without the slightest suspicion ever having been cast upon the bird-cage or poultry yard. Koch has demonstrated the course of tuberculosis in fowls and observed the bacilli to be very abundant in the intestines and liver, while Nocard speaks of the peritoneum, lungs and joints as being affected, and Walley gives a beautiful illustration of the disease affecting the mouth and throat of a hen, in his work on meat inspection. Others speak of the horny tumors of the skin, face, head, neck and feet as being common accompaniments of the complaint, which often contain numerous bacilli within their meshes. A more or less interesting statement is made by Salmon with regard to the dissemination of tuberculosis from the bird to the human being in his most interesting paper upon Avian Tuberculosis read before the United States Veterinary Medical Association at their last meeting, in which he says: "An observation indicating still further the danger to mankind of contagion from certain birds was recently recorded by Durants. The subject, a woman seventy-one years old, without any previous history of disease, was seen among the patients of that well-known hospital, the Hotel Dieu. The woman had lost a daughter of tuberculosis in 1885 and was living with another daughter aged thirty-five years who was rachitic and probably tuberculous. In 1890 she was presented with a sparrow. In 1892 this bird which had previously been in good health appeared to be ill. It became dejected, irritable and one day pecked its mistress at the root of the thumb nail with sufficient force to cause slight bleeding. The illness of the bird continued and it finally died without the nature of the disease having been determined. Five or six months after receiving the slight wound the woman noticed a crust forming at the injured point. As this lesion continued to develop she came to the Hotel Dieu for treatment in April, 1894. She was found to be affected with lupus (tuberculosis of the skin) which had invaded two-thirds of the dorsal surface of the second phalanx of the thumb. There existed in addition a second nodule the size of a pea at the middle of the interior surface of the forearm and two similar ones in the fold of the elbow joint. The lupus was treated by the cautery and the woman appeared completely cured in December, 1894. The nodule in the fore-arm was extirpated and divided into two parts. One portion was examined histologically and showed the characteristic tuberculosis with numerous giant cells, but it was impossible to discern the bacilli. The other portion was used for the inoculation of a Guinea pig which died of general tuberculosis. From the spleen of the Guinea pig there were inoculated a pigeon which was sacrificed at the end of a month and found free from lesions, and a rabbit which died at the end of a month of generalized tuberculosis. The woman was therefore affected with tuberculosis. As no examination was made of the sparrow it could not be positively affirmed that it was affected with tuberculosis, but the fact that it was affected with a chronic and fatal disease and the development of the lupus at the point injured by the bird's beak are strong presumptive evidence that it was suffering from this disease, as the tuberculous lesions with birds are frequently localized at the commissure of the beak and as the saliva may contain numerous bacilli, it is easy to understand how the inoculation might occur. Whatever may be our views therefore as to the identity of the tuberculosis of mankind and of the gallinaceæ, it is demonstrated beyond question that certain caged birds may contract human tuberculosis and become centers for its dessemination. This is a most important fact for veterinarians and sanitarians in general and for the public to recognize."

With regard to the symptoms of tuberculosis in the bird they can only be spoken of in a somewhat general way, auscultation and percussion being of but little value in these creatures. The cough, too, is not of such a nature, so far as has been observed, to enable one to recognize it as the cough of a tuberculous patient. There are, however, some symptoms which assimilate tuberculosis in other animals, for instance, prostration accompanied with marked emaciation. When the joints are involved the animal will be lame. When the mouth is involved, as it often is, the lesions of disease can be seen by forcing this cavity open especially in birds of the size usually found in the poultry yard.

ETIOLOGY OR CAUSE OF TUBERCULOSIS IN THE POULTRY YARD.

Many cases of the disease are occasioned by the importation of animals affected with the disorder but a number of cases have been reported to me where I suspected, to say the least, that the disorder was the result of expectorations from phthisical attendants of these animals, which suggests that persons who are affected with the disorder should not take charge of the poultry yard, or if they do they should be exceedingly particular with regard to the distribution of all expectorations.

MACROSCOPIC, OR OCULAR APPEARANCE OF TUBERCULOSIS.

This materially depends upon the course which the disease pursues during its invasion of the affected part and can only be described in a somewhat general way, without making the description too lengthy for those who have to read and run.

In typical cases where we have the miliary variety—let me say in the first place that this term is supposed to have originated from the fact that little groups of numerous tumors about the size of the millet seed are found studded, to a greater or less extent, over the surface of certain membranes, such, for instance, as the pleura (the membrane lining the chest) or the same membrane which is also reflected immediately over the lungs. I have seen cases where the omentum, commonly named the caul, has been studded with scores and scores of these little nodules, varying in color from a pearly white to a pink or greyish hue. In other instances we find the disease consuming a considerable space, if not the entire organ involved. In such cases I have found it a more or less hard rubbery like substance, this when cut into produces a sensation upon the knife which reminds one of the grating occasioned by cutting through so much sand and clay mixed together. Indeed this gritty sensation which is imparted to the blade of the knife by the impacted mass of diseased tissue is nothing more or less than certain salts of lime which are to be found in large quantities in advanced stages of the disease. Then, again, we find these lumps, large or small as the case may be, filled with a material that has a cheesy consistence, hence the term, *caseous tubercle.* In other instances the tumor will be broken down in its center and the walls of it inclose a thick, creamy-like fluid which varies materially, according to circumstances. Appearances such as I have endeavored to describe are to be found in connection with the various organs of the body. In the early stages of the disease we sometimes find recent tubercle presenting a red color, resembling red hepitizadation while in other instances the surface of the affected gland will have a gelatinous granular appearance.

CHEMISTRY OF TUBERCULOSIS.

According to the investigations of some chemists, notably Dr. Glover of New Castle, as quoted by Williams, tubercle consists of animal matter mixed with certain earthy salts; the relative proportion of these varies in different specimens; the animal matter is more abundant in recent tubercle and earthy cells in chronic tubercle; the animal matter consists almost entirely of albumen mixed within a minute quantity of fibrin and fat; the earthy salts are principally composed of the insoluble phosphates and carbonates of lime with a small proportion of the soluble salts of soda.

GENERAL SUMMARY OF ORDINARY SYMPTOMS.

What has been said concerning the symptoms of tuberculosis can only be regarded as links in the chain of evidence condemning the animal as being affected with the disease. They are sufficient, however, to show the intelligent reader that the diagnosis of tuberculosis is not a trivial matter; and, if the brief description does nothing more, it is hoped it will save innocent persons from being victimized by those who assert their opinions firmly and positively, but who really know very little, if anything, about the disease.

SCIENTIFIC DIAGNOSIS OF TUBERCULOSIS.

If we desire to proceed in a truly scientific manner with our diagnosis of tuberculosis we may do so by employing one or all of the three following methods; namely, a microscopic search for the bacillus; inoculation of suspected material; or injection of tuberculin.

At one time it was hoped that the microscopist could diagnose the disease with his instrument. And so he can in many cases, but because he does not find the germ in any of the excreta it does not prove the animal free from the disease. The germ may be there one day and away the next, or the poison may be eliminated in such a condition as to escape detection by any known method so that his efforts are thus defeated. Again it is well known to microscopists, that it is sometimes a matter of much difficulty to find the germ in tissues which are even badly affected with the disease without the most extended and careful search. It is apparent, then that it is not a difficult matter to overlook its presence. Notwithstanding this we are frequently gratified by being able to diagnose the disorder with absolute certainty by means of the microscope.

If we are unable to find the germ with this instrument the method of inoculation may be resorted to. It is perhaps unfortunate that this method of diagnosis consumes much time; it often being several weeks before the disease has developed in the inoculated animal to the extent that it may be recognized. So the bacteriological mill is rather slow or uncertain for ordinary commercial purposes of today; especially when we have such a valuable, effectual and certain diagnostic agent as Koch's Lymph or Tuberculin. The description of this remarkable substance was first announced to the public about six years ago, at which time it was thought to be a curative agent for tuberculosis. It did not, however, give as flattering results as were looked for, so it was abandoned by many as a cure. However, future investigation may revive an interest in it, and show that it has curative properties if used under certain conditions yet to be determined. But even without this curative value tuberculin is now recognized the world over as the most reliable, safe and practical method of diagnosing tuberculosis in the early as well as the later stages, that is in the possession of mankind, and consequently becomes a boon to our race. It may be interesting to note that when this agent was first used it caused an elevation of temperature in the body above the normal, eight or ten hours after it was injected, while it was noticed that animals free from the disease were not affected with this elevation of temperature. This soon led veterinarians to apply it as a diagnostic agent. Without following its history very closely let me say that it has fought its way to the front, as it were, until today there are few, if any, who dispute its diagnostic value. But, like all new things, it had to run the gauntlet of adverse criticism, some saying that many cases were unaffected by it,—too many, indeed, to warrant its use in a general way, and so on. As time wore on, however, those who persisted in the use of it, became most enthusiastic in its praise, as its great benefit was slowly but surely impressed upon them, and the errors in diagnosis which were blamed to tuberculin are now being accounted for in some other way. Indeed, carelessness in searching for the lesions is now admitted to be the cause of many failures in discovering them. Some, however, asserted that an objection to its general use was that it caused reaction in other diseases, notably actinomycosis, or lumpy jaw; while others contended that it left some cases of advanced tuberculosis unaffected, missed them, so to speak, on account of the medicine not causing its characteristic reaction. With regard to the first objection I may say that, while the agent may not be infallible, yet I have tested it in three cases of actinomycosis, and it did not cause characteristic reaction. It may be interestng to note that in two of these cases I followed the disease through the bacteriological mill. The contents of the tumors were examined microscopically for the bacilli and none found. The same tumors were then examined for the ray fungus of actinomycosis and it was readily discovered in great profusion. Some of the material was then injected into the abdominal cavity of a Guinea pig with the usual bacteriological precautions but, up to the present writing tuberculosis has not manifested itself. In another instance I applied the tuberculin test to a number of cows. Two of them had external manifestations of actinomycosis; one of them reacted in a manner indicating tuberculosis,—the other did not. The inference was that one cow had tuberculosis and actinomycosis at the same time, while its stable companion which did not react, had only actinomycosis. It was my intention to have followed these cases, step by step, through various bacteriological methods, but, owing to the herd becoming involved in litigation, I was unable to proceed in the manner I had first intended.

With regard to the second objection, I have in mind several animals which presented striking evidence of tuberculosis, on ordinary examination, having more or less cough, capricious appetite, loss of flesh even to emaciation, and general conditions which would lead one to regard them as pronounced cases of tuberculosis. I applied the tuberculin test to all of these animals, more as a matter of curiosity to see how it would affect them, and will say that to my surprise, it did not produce its peculiar and characteristic reaction. I supposed that these were cases of failure, and was inclined to blame the tuberculin, until an autopsy was held; when I was amazed to find,—or rather not to find,—any evidence of tuberculosis upon macroscopical examination. Two of these cases were diagnosed as chronic or interlobular pneumonia and the third one as chronic indigestion. The fourth case was followed even further,—microscopical examination being made of the diseased tissues, but the germ could not be found. Inoculation of the diseased portion of the lesions was then made into a Guinea pig, but that animal has not shown any evidence of the disease, either upon ante or post-mortem examination notwithstanding that several months elapsed since the operation was performed. All evidence in this case is opposed to tuberculosis, except perhaps, the general appearance of the cow, before it was killed. I have used tuberculin in upwards of a thousand instances in this State during the past two years and have not discovered a case in all these which would impeach the test. Further accuracy of the test may be gathered, if necessary, from the following, which is recorded by the experiment station of Alabama:—

"Out of 4,068 animals in various parts of the United States, tested by various persons and various forms of tuberculin, 1,137 animals reacted and 1,118 exhibited undoubted tuberculous lesions upon post-mortem examination. In 19 of these that reacted the investigator failed to find any visible tubercular lesions. The microscope was not used and possibly the post mortem examinations were not as thorough and complete as they might have been." Admitting that the 19 cases were not tuberculosis, this would be less than one failure in 500 tests. In Massachusetts the cattle commission have tested over 25,000 cattle and they have found the tuberculin at fault in only one out of every four hundred cases tested."

The application of the tuberculin test has proved so accurate in diagnosing the disease in this country that the United States Veterinary Medical Association were led to adopt the following preamble and resolutions concerning it, at their last meeting, held in Buffalo, in September, 1896.

"WHEREAS, Tuberculosis of some of our domestic animals, and especially of cattle, is a wide-spread and destructive disease; and

"WHEREAS, The statistics accumulated during the year past show that the disease is very prevalent throughout this country, especially in dairy herds, indicating that it is steadily increasing, except in states where active measures for its suppression have been enforced; and

"WHEREAS, There exists in some quarters a difference of opinion as to the relation of tuberculosis among cattle to the public health, notwithstanding the fact that this matter has been the object of careful scientific inquiry by a great number of eminent scientists in all parts of the world, and that reliable and uniform observations are recorded in great numbers in the veterinary and medical literature by it;

"*Resolved*, That it is the opinion of the United States Veterinary Medical Association that the following points have been demonstrated beyond dispute, and may be accepted as fully established:

"First, that tuberculosis of man and cattle is identical. Second, that the milk from cows with tuberculous udders may cause tuberculosis in animals fed upon it. Third, that the milk from cows with extensive tuberculosis, but apparently healthy udders, may, in some cases, contain the germ of tuberculosis, and cause the disease in animals fed upon it. Fourth, that in some cases the germs of tuberculosis appear in the milk of tuberculous cows that are not far advanced in the disease, and of others that are healthy, so far as can be determined by an examination made during the life of the animal. Fifth, slightly tuberculous cows sometime succumb to the sudden exacerbation of tuberculosis and furnish virulent milk for a period before it is possible to discover their conditions by means of physical examination. Sixth, tuberculin furnishes incomparably the best means of recognizing tuberculosis in the living animal. Seventh, tuberculin, properly used for diagnostic purposes, is entirely harmless to healthy cattle and is so exceedingly accurate in its effects that the few errors resulting in its use cannot affect the general results, and are of less frequent occurrence than following the use of any other method of diagnosing internal diseases. Eighth, that the carcasses of tuberculous animals may be and sometimes are dangerous to the consumer, and all carcasses should be subject to a rigid inspection by a competent veterinarian, and those that are condemned should be disposed of in such a manner that it will be impossible to put them on the market for consumption as human food. Ninth, that the importance of dairy inspection cannot be overestimated, and municipal and health authorities should at once perfect a system commensurate with the vast importance of the subject.

"*Resolved*, That the live stock, and especially the breeding interests of this country, can never regain their former prosperity until such measures have been carried out by the National and State governments as will afford some reasonable guaranty against the continued ravages of this disease. And, in view of the prevalence of bovine tuberculosis in foreign countries and the measures taken by some of them to protect their cattle from infection, the United States should prohibit the importation of breeding animals until they have been proven by the tuberculin test to be free from the disease."

Having said so much in favor of tuberculin as a diagnostic agent it is only fair to discuss the other side of the question to some extent, as my own experience might lead one to become too favorably impressed with this agent. This side of the question is so ably discussed by Prof. Law in his bulletin No. 65, Cornell University Experiment Station, that perhaps I cannot do better than insert his paragraphs here, to wit:

"OBJECTION TO TUBERCULIN AS A TEST.

"First, the temperature sometimes rises in a non-tuberculous cow after the use of tuberculin.

"This is true. So does the temperature sometimes rise in a non-tuberculous cow when no tuberculin has been employed. Every animal is liable to suffer from inflammation and fever, and if such inflammation and fever set in after the use of the tuberculin test they are liable to be charged to it as their cause. This is a valid argument against the reckless popular use of the tuberculin, but surely not against its use in skilled hands. The person who uses the tuberculin on cattle must be a trained veterinarian, acquainted with the different diseases of cattle, and on his guard against confounding any of these with the temporary fever caused by the tuberculin in the consumptive. If it claimed that every rise of the body temperature after the use of tuberculin must necessarily demonstrate the existence of tuberculosis, then truly tuberculin will be discredited. But if it is held, rather, that a rise of temperature after tuberculin, in a cow that furnishes to the most careful and skillful comparative pathologist no evidence of other disease, implies the existence of tuberculosis the claim is substantially correct. To secure the valuable testimony of tuberculin, the practitioner must be highly skilled in the diseases of the animal operated on. If he is not he will be occasionally misled.

" Again *heat* or *bulling* may come upon a cow after the use of the tuberculin and the temperature may rise two or three degrees. To call such a cow tuberculous would be inexcusable carelessness. Yet the condition demanded, the rise of temperature after the use of tuberculin, is present.

" Again a cow that is closely approaching calving has the temperature raised. If tuberculin is used it is often raised higher than it would be otherwise. It is therefore improper to use this agent on a cow at this period.

N. B.—I have often used tuberculin. Just before and just after calving and up to this time it has done its work all right, notwithstanding we should be ready to make allowances.—(Grange).

" Active exertion, exposure in the hot sun, confinement in a close building, the privation of water at the customary time and other conditions will cause rise of temperature. But such a rise would not imply tuberculosis, even after tuberculin.

" Apart from these and other such causes of error in unskilled hands, the rise of temperature under this test should be taken not as a condemnation of tuberculin, but as a stimulus to search for small occult tubercles. A thorough search will rarely prove fruitless.

" Second, The temperature sometimes fails to rise under the tuberculin test, though the animals be in the last stages of tuberculosis.

N. B.—My own experience in cases which were supposed to be in the last stages of tuberculosis which did not react were really affected with some other disease as was shown by other lines of investigation than the tuberculin test and repórted in another page of this article, but I wish to emphasize the thought that we must be conservative in condemning tuberculin if it does not appear to do its work in a correct manner.—(Grange).

" Third, Tuberculin causes reaction in even the slightest cases of tuberculosis, in which the victims would survive for years and might recover.

" This charge is also true, and it is because of its truth that tuberculin is invaluable and indispensable as a diagnostic agent, in all attempts to put an end to the disease. An eminent German professor (Eggeling), in objecting to the use of tuberculin as a general test records the following experience. In a herd of 37 reaction after tuberculin occurred in 31, while 6 gave no reaction. When killed the six proved sound and the 31 without exception tuberculous. But of the 31 only one had general tuberculosis and was condemned as unfit for food, and one was sold as second class meat. The 29 brought first-class prices as meat, and having been only slightly affected would probably have lived for years without infecting others. Now it is submitted that the German standard as thus given is not radical enough to secure safety for man and beast, or to give hope of an early extinction of tuberculosis. The meat of the animal with two or three tubercles in one organ is generally, but by no means always, free from the germ. When the disease does extend from such isolated tubercles, as often happens, the germ is carried not only in the lymph, but in the blood, and with tubercle in the body no one can tell when the bacillus has passed into the circulation and reached the different organs. Tubercles usually form slowly and the bacilli must have been in the blood for some time before they show as fresh tubercles in tissues and organs distant from the old ones. The meat of a tuberculous animal can never therefore be fully guaranteed as safe to eat. But again, while a cow with one or two tubercles only in lymphatic glands, may not be liable to transmit the disease to others, yet whenever an extension takes place, the germs being carried by the blood and therefore throughout the whole system, there must always be danger of their escape from the natural surfaces (lungs, udder, liver, bowels, etc.) to infect other animals. And let it be borne in mind, this diffusion through the blood takes place before its occurrence is revealed by the formation of tubercles in new situations. So long, therefore, as a single victim of even slight tuberculosis is left in a herd it can only be looked upon as an invitation to a renewed extension of the disease. It also may become at any moment a source of infection for man through the use of the meat or milk. It is only in degree that the contagion of tuberculosis differs, as to its sanitary aspect, from that of any one of the more contagious diseases, and in all alike so soon as we attach more importance to the preservation of an infected animal that will probably recover, than we do to the radical extinction of the disease, we undermine and destroy the effectiveness of our sanitary work. Practically all cases of foot and mouth disease recover; yet the frequently occurring epizootics of this disease each cost from $5 to $10 per head over the entire bovine population. Of the victims of rinderpest and lung plague that do not speedily die, practically all recover. Are the slighter cases therefore to be kept alive to perpetuate indefinitely those disastrous visitations that sweep away values of hundreds of millions? Is the remorseless scourge of tuberculosis to be perpetuated, not only in herds, but in our homes as well, to save for a few months or years some tuberculous cows? No country has ever dealt successfully with any of these animal plagues on the basis of preserving the mild cases of recovery. Always and everywhere it has been by the radical and thorough extinction of the disease germ wherever found, that success has been achieved. While this cannot be done for man, it must be done for our flocks and herds if we would ever cut off this prolific animal source of tuberculosis from the human race. Even as regards the herds themselves the stockowner who would consult his own future interests, would at any cost exclude from his barns and fields every possible source of future tuberculosis.

"4th. A fourth objection to the tuberculin test is its alleged liability to produce tuberculosis in healthy animals, or to aggravate it in the tuberculous ones.

"Now, tuberculin, properly prepared is absolutely sterilized, so that it can plant no living germ nor start the growth of any tubercle in a healthy animal. The further claim that it aggravates tuberculosis which is already in existence, is too true, and is the sound basis of its value as a test. As a means of testing the existence of tuberculosis in man it cannot be too strongly condemned, since no man has a right to seal the fate of his fellow for the sake of finding out if he has tuberculosis. The same condemnation must be passed on the use of tuberculin as an alleged curative agent, except in those few cases in which the tubercle is confined altogether to the surface of the body, whence it can easily be sloughed off.

The existence or possible existence of an internal or deep-seated tubercle in man should forbid the use of tuberculin for diagnosis or for curative purposes.

"The same remark would apply to animals if we adopt the German view that it is impolitic to destroy those that are only slightly affected. If tubercle exists, to however limited an extent, tuberculin tends to aggravate it, and the owner who wishes to preserve his mild cases cannot desire to have them made worse, which means to have the disease extended and possibly generalized.

"So in government sanitary work. Unless the government is prepared to slaughter and pay for every animal affected with tuberculosis in however slight a degree, it has no right to use a tuberculin test. It is only when the State means to make thorough work in eradicating tuberculosis from the herds that the tuberculin test is at all admissible. But when the State aims at the thorough extinction of the disease in our herds this test cannot be omitted, as it is absolutely essential to success. The temporary aggravation of the disease is no possible harm, when the animal is to be promptly killed and paid for.

"To sum up: The tuberculin test aggravates existing tuberculosis and is, therefore, unwarrantable for use on man or on cattle that are to be kept alive; it is, however, the only known means of detecting many occult cases of tuberculosis and is, therefore, indespensable in any systematic effort to stamp out the disease by the purchase and slaughter of every tuberculous animal."

Having said this much about tuberculin it may be interesting to the reader to know just what this material is. It is, in substance the product of the germ of the disease, and is obtained something after the following fashion:

The germ of the disease is grown in a certain fluid manufactured in the laboratory by obtaining broth from veal to which glycerine may be added. This culture medium, as it is called is placed in delicate flasks and the seed, so to speak, from the pure culture of the tubercle bacillus is planted. After a time a growth appears over the surface of this fluid and in the course of several weeks the growth of the germ ceases. The fluid is then evaporated according to laboratory methods and the result is crude tuberculin. After manipulating the material on orthodox principles it is subjected to a degree of heat sufficient to remove all trace of life so that it becomes absolutely innoxuous so far as producing tuberculosis is concerned. The concentrated material is injected in the most minute doses, from four to six drops being sufficient to produce the characteristic elevation of temperature in the body of a cow weighing between one and two thousand pounds. For convenience in handling it is customary to dilute the concentrated solution before injection.

THE APPLICATION OF THE TEST.

The plan which I have adopted for applying the test is, substantially that which has been recommended by the bureau of animal industry of the Department of Agriculture at Washington, D. C., which suggests that the temperature of the animal to which the test is to be applied shall be taken every two hours during the day previous to the injection of the fluid. About ten o'clock at night the fluid is introduced beneath the skin of the animal—about a half teaspoonful of the fluid which has previously been diluted for convenience in handling. It is customary to administer about half the dose to yearlings and two-year-olds, while very large cows and male animals receive about a teaspoonful. It has been my custom to leave the animals to themselves after injection for about eight hours, when the temperature is again taken, and observations of the heat of the animal's body should be made every hour during the day after the tuberculin has been administered. My observation has been that those animals which are affected with the disease begin to react about nine or ten hours after the medicine has been given and continue to do so for about four or five hours when the temperature will begin to fall and soon reach the normal. There is, however, considerable variation in individuals in their behavior as to the time and degree of reaction towards the medicine. It is custimary to regard an animal as affected with the disease when it shows a temperature two degrees above the highest point of the day previous to the administration of the medicine. In cases where the reaction is less than two degrees it has been my practice, where I have had full control of the herd, to place such animal in the doubtful list, to be retested at a future time.

A brief account of some animals which were placed in the doubtful list will, no doubt, impress the reader with the very great importance of careful manipulation of the thermometer in reading it, and also impress upon him the advisability of retesting animals which have shown the slightest indication towards a rise in temperature the day after the fluid has been given.

On the 31st of March, 1896, I tested a herd of 67 cattle. Among them, nine animals reacted in a manner indicating tuberculosis, while 18 of them dropped into the doubtful list, one of which only reacted one-tenth of a degree, another three-tenths of a degree, another six-tenths of a degree, and still another one degree and eight-tenths. On the 11th of May these animals were retested. The first one reacted two degrees and six-tenths, the second one, six-tenths of a degree, the third one, one degree and five-tenths, the fourth, two degrees. The first and fourth were condemned according to the requirements of the test. The fourth animal was badly affected with the disease which was very apparent upon the most casual observation. The first one, or No. 1, although reacting two degrees and six-tenths did not show any external manifestations of the disease but was killed and after a diligent search some of the cheesy tubercle was discovered. Not being satisfied with the ocular examination the microscope was used when the bacillus was discovered. Besides this some of the material was inserted beneath the skin of a Guinea pig, which eventually died of tuberculosis and in this animal the germs could readily be seen when stained according to Zeil's method. No. 4 was also killed and showed such exaggerated lesions of tubeculosis that nothing more was done so far as studying the disease in her was concerned. Nos. 2 and 3 were again retested in August, No. 2 reacting two degrees and eight-tenths, No. 3 reacting one decree and eight-tenths. The latter two are at the present time being held for experimental purposes. It is worthy of note that three of the four animals would not have been considered as being affected with the disease according to the methods adopted in transatlantic countries where it is stated, according to a description of the application of the test, in a volume written by Nocard: "Elevation of temperature of less than eight-tenths of a degree has no meaning. Every animal whose temperature indicates an elevation between eight-tenths of a degree and one degree and four-tenths must be considered under suspicion and will have to undergo, after an interval of a month or so, a new injection of a larger dose of tuberculin." It is probably owing to the fact that sufficient importance has not been attached to the minutest elevation in temperature that tuberculin has been wrongfully blamed for missing cases that were afterwards shown to be affected with the disease. Setting the condemning figure at one and four-tenth or two degrees is only arbitrary as far as I am aware. Experience with tuberculin has caused me to believe that if this agent causes the elevation of temperature, even to a slight extent, it is an indication of tuberculosis. Unfortunately we are not able to tell whether it is the tuberculin or something else which causes this elevation, so a wide margin is taken and set at two degrees and mistakes are reduced to the minimum in careful hands.

It may not be necessary at this time to produce a detailed account of all the temperatures of cattle which have been tested in this State with the records of their post-mortem lesions, as such an account would burden the pages of this report without compensating the reader sufficiently for perusing them. It may, however, be interesting to speak in a somewhat summary manner of one case where I applied the test, it being of much interest in this commonwealth. The case which I have reference to was at the State Public School at Coldwater, to-wit: A year ago last May I was requested by the Board of Control of that institution to examine their cattle, as it had been reported that one which had recently been slaughtered was affected with some mysterious disease. I proceeded as requested and have here to say that I cannot call to mind ever having seen 26 animals in apparently healthier condition,—housed amid most comfortable surroundings with everything that an ordinary cow required. After having passed through the herd and watched their behavior in the stanchions for some time I stated to the superintendent of the institution that so far as I was able to see his herd appeared to be in a healthy condition. But I was well aware from an experience of many years that no man could detect the disease although it had made extensive inroads upon the economy of the animal. So I informed him that a number of them might be affected with tuberculosis. I suggested this disease because I thought from his description of the animal which had been slaughtered that this disease prevailed in its internal economy. It may be interesting to know that the cow referred to was not slaughtered because she was sick, but because she was ripe, or thoroughly fit for the shambles, and was not profitable in the dairy. After giving the authorities my experience with this disease it was finally determined that the tuberculin test should be applied, which was done in due course, and 18 animals out of 26 showed characteristic reaction, indicating tuberculosis. They were all slaughtered and in every individual abundant evidence of the disease was shown to convince the most sceptical without going beyond the macroscopical examination. The post-mortems were held in the presence of a number of physicians of the city of Coldwater, and also Professors Vaughan and Novy of the bacteriological laboratory of the University of Michigan, who, I may add, followed some of the tissues through microscopic examination and illustrated the presence of the germ in them.

PERCENTAGE OF CATTLE AFFECTED WITH THE DISEASE IN MICHIGAN.

Up to January 1, 1897, I have tested 849 head of cattle and found reactions indicating tuberculosis in 107 of them. This would be about 13 per cent of the number tested. It must be remembered, however, that my investigations have, with one or two exceptions, been amongst cattle in which there were good grounds for suspecting the presence of the disease. So that such a high percentage of affected animals can hardly be regarded as a fair estimate. In a few instances as a private practitioner I have tested a number of herds belonging to sanitariums of this State and have not found indications of the disease in a single instance. In one case I tested no less than 8 herds surrounding a city of about 12,000 inhabitants. The herds varying from 6 to 30 animals, and numbering in all 114. In another instance I tested 22 head in close proximity to a small city without finding indications of the disorder. These nine tests lean toward the idea that tuberculosis is the exception rather than the rule in the commercial cattle of this State—nevertheless too much emphasis cannot be laid upon the vigilant attitude we should assume towards the disease as it frequently manifests itself in the most unsuspected places.

THE GERM

is about one fifteen-thousandth part of an inch in length, its width being one-tenth of its length, more or less. It varies, however, somewhat in length in individual specimens. In stained preparations unstained portions are frequently seen which are believed by some to be spores, but this is by no means certain. From two to six of these unstained spaces may often be seen in a single rod, and owing to these alterations of stained and unstained portions the bacilli may under a low power be mistaken for chains of micrococci. The rods are usually solitary but may be united in pairs or in short chains containing three or four. In old cultures, irregular forms may be observed, the rods being sometimes swollen at one extremity or presenting the appearance of having a latter bud-like projection. These are called involution forms.

LIFE HISTORY.

The germ is a parasite which requires oxygen for its prolific growth, it will grow, however, in the absence of free oxygen. It is very exacting in its temperature requirements, only growing luxuriantly at all events within a few degrees of 102 Fahr. The question of spore formation has not been definitely determined but it is thought that the unstained spaces already alluded to may be spores and this idea seems to be supported by the fact that caseous material in which the most careful microscopical examination fails to find the germ of tuberculosis, but when a small portion of this caseous matter is inoculated beneath the skin of the Guinea pig it will produce the disease. The only feasible explanation which can be offered at the present time is that this material contained the spores of the germ, if not the germ itself. But at the same time the fact must not be lost sight of that these germs are exceedingly small and may have escaped detection in the material examined. There has been considerable objection offered by the most prominent workers to the idea that spores do appear in the bacillus. Without attempting to discuss this question further it may be better to leave that side of it to the bacteriologist.

VITALITY.

The germ is difficult to stain; due, it is thought, to toughness or some peculiarity of the cell wall, and there seems to be some relation between this condition and the vitality of the microbe, for it does not appear to be readily destroyed by ordinary means or long keeping. Koch, as well as others, have shown that it retains its vitality for nine months in dry sputum, after which period it is capable of reproducing the disease in an animal exposed to its influence.

In as much as the application of heat is a popular way of destroying this germ it may be interesting to quote a few experiments which have been performed to test the vitality of the organism under the influence of increased temperature. Considerable experimentation has been done by various noted men, and it may be only necessary for me to report here the results of their investigations. Assuming that the tubercle bacillus forms spores a number of experiments to determine the thermal death point have been made. The sputum containing the bacillus has been subjected to a temperature of 212 Fahr., and afterwards inoculated into Guinea pigs. It was shown that exposure to this temperature for from two to five minutes was effective in every experiment with but one exception. One Guinea pig died tuberculous after having been inoculated with sputum exposed to this temperature for two minutes. This result was assumed to show that the bacillus would survive lower temperatures but it is evident that additional experiments were required to establish this fact.

In 1887, Sternberg, Surgeon General of the U. S. Army, made a few similar experiments at lower temperatures, and Guinea pigs inoculated with tuberculosis sputum exposed for ten minutes to the temperature of 90 C., 80 C., and 60 C., *failed to become tuberculous*, while another Guinea pig inoculated with the same material after an exposure to a temperature of 50 C. for ten minutes died tuberculous.

These results correspond to those subsequently reported by Yersin, who tested the thermal death point of this bacillus by the culture method. This author assumes that the bacilli form spores, but states that as a result of his experiment that at the end of ten days, bacilli heated for ten minutes at 55 C. gave a culture in glycerine-bouillon, those heated at 60 at the end of 22 days while those heated to 70 and above failed to grow in every instance. This experiment repeated a great number of times always gave the same result. The bacilli, then, resist a temperature of 60 C. for ten months and it is to be remarked that the resistence of spores to heat appears to be no greater than that of the bacilli themselves. Yersin remarks in a foot-note that the spores which served for these experiments did not appear as more or less irregular granules taking the coloring matter strongly, but as vertible spores with sharply defined outlines to the number of one or two in a bacillus or three at the outside. These spores are particularly clear in cultures upon glycerine agar several weeks old.

Pursuing the investigation from a different standpoint, cold has been applied, but it has been shown that the germ survives a freezing temperature. The germs have been subjected to an influence of freezing for four or five days and still possessed their infecting properties. So that ordinary winter temperature cannot be regarded as an effectual disinfectant in a short time at all events.

Putrefaction within certain limits is not fatal to the germ, it having been shown that it will resist the influence of this condition for a considerable length of time,—over 100 days. It is not destroyed by the gastric juice of the stomach as shown by several investigators. A portion of the lung of the cow was preserved for 110 days, dried and pulverized, the dust of which produced the disease in Guinea pigs. It is preserved in water, in springs, in ponds and wells at ordinary temperatures for an indefinite time, hence the danger of permitting animals to drink from troughs that have been contaminated with the discharges from affected animals.

The germ is devitalized by exposure to the sun's rays for a time and even by diffuse light. It remains infective in the earth for a period not to be determined, possibly indefinitely. The salting of meat is thought to destroy it in about a month if the salt is liberally applied. The cooking of meat, if thoroughly done, will destroy the germ but it will require an absolute heat of say 160 Fahr. for 15 minutes, but it is difficult to determine the exact heat of the interior of a large roast, hence the necessary precaution of having meat thoroughly cooked to insure safety against this organism. Touissant found that broiled steak which had only reached 176 Fahr. was capable of producing the disease providing this degree of temperature was not kept up for a considerable length of time.

TREATMENT.

It is questionable from the moral standpoint, in the present light of our knowledge with regard to the cure of this disease, if treatment in a general way should be recommended, so we must be somewhat conservative in this matter.

While it is not admitted on all sides that the disease is incurable in every instance, yet the danger of unhappy results accruing from careless handling of affected animals warns us against prolonging the existence of such animals, although cases have been brought under the writer's notice which have been most convincing that the germ of the disease has been overthrown or conquered by the right kind of a constitution and proper hygiene. Concerning this phase of the question, we hope to have more to say in a future report.

PREVENTION OF THE SPREAD OF THE DISEASE IN A HERD.

We would recommend the application of the tuberculin test in all cases which are attended with the slightest degree of suspicion and believe that it is a wise precaution to apply the test even in herds that are not suspicious, as much for the satisfaction of the owner as, perhaps, for anything else.

In herds which are sprinkled with the disease they should be divided into three classes: First, those which fail to show any reaction to the agent, may be regarded as healthy; second, those which react less than two degrees are to be placed in the quarters provided for the suspicious list: third, those which react above two degrees should be placed in the condemned stalls if not summarily disposed of there and then. If the desire is to raise a healthy herd from condemned animals they should be kept by themselves and it would be well to have different attendants to wait upon the different lots. Pails and other utensils should be provided for the different lots of animals. If the condemned animals are to run at pasture a lane of from 15 to 20 feet wide should separate them from all others; a simple fence is not sufficient, though in the stables a close board partition may be all that is necessary.

OTHER PRECAUTIONS.

It is well to observe certain precautions in order to keep the disease out of a herd, and it is wise not to allow foreign animals, that is, cattle from other herds to mingle with our own unless they have been tested with tuberculin within a year or so. No cow should be permitted upon our premises with a husky, rattling cough, wheezing, hurried breathing, discharge from the nose, fœtid breath, hard tumors on any part of the body, swollen joints or general unthriftiness, or one which is suffering from chronic indigestion. These symptoms, one and all, are often the result of tuberculosis.

In testing animals it will be profitable to employ a skillful veterinarian, rather than to proceed with the aid of those who are not versed in the diseases of cattle. It is dangerous and improper to permit consumptive persons to attend to cattle.

Tuberculous animals that are to be destroyed are most effectually disposed of, germ and all, by cremation.

CARE OF THE STABLE AFTER DISEASED ANIMALS HAVE BEEN REMOVED.

The precautions will of course depend somewhat upon the value of the stall. If worn out and cheap it will be best to tear it down and place in a pile to be burned up at the earliest possible moment. In tearing down such stalls and removing the debris it may be well to saturate all parts with water in order that the germ, if present, may be prevented from floating in the air with the dust that is aroused by such a procedure. Some care should be exercised in handling boards of this nature, not to get splinters of them into the hands or other parts of the body. It may be well to wear leather gloves. The refuse matter and floors are also to be burned. If the stalls, on the other hand, are new and expensive, it may be well to wash them first of all with hot water, the hotter the better, after which they should be sprinkled with a mixture of corrosive sublimate, say one ounce to about 8 gallons of water. The water should be placed in wooden vessels and the sublimate added to it. The whole should be allowed to stand for 24 hours, to allow the sublimate to become entirely dissolved. Since this solution is poisonous it should be kept in covered vessels. It may be applied with an ordinary watering can or spraying pump, though it must not be forgotten that if allowed to remain in a metal pump it may injure that article to a considerable extent. Before the solution is applied all compost should be removed from the floor as well as other parts of the stall. This compost should be destroyed by burning, and in removing it the same care should be observed that was recommended with regard to the old stalls; that is, it should be thoroughly sprinkled in order to prevent the dust of it with attached germs from contaminating the air.

After the corrosive sublimate has been applied, say 24 hours, it is advisable to whitewash the stalls, mangers, stanchions and parts that are likely to come in contact with animals in the future. There are numerous solutions recommended for disinfecting stalls, but the one suggested is probably as good as any. The extra precaution of whitewashing is desirable for this material, when dry, forms a crust which will imprison any germs which might have escaped the spray of the disinfectng fluid and by prolonged drying they become harmless. A second coat of whitewash will not only be an extra precaution but it will add materially to the appearance of the compartment.

In preparing whitewash, the writer's experience has been that freshly slaked lime and water is preferable to any other mixture. We mention this because it is a common practice to put glue, salt and other minerals into the wash to cause it to stick, but instead of doing so it will often have the opposite effect, and cause it to scale and drop off. The stable, after being treated as above, should be thoroughly aired and all the sunlight let into it that is possible under ordinary circumstances. The cattle which may be left after the test should be housed as little as possible. Fresh air and sunshine being enemies to the invading germ by invigorating the constitution of the host, should be permitted to work their beneficial effects upon the animals on every possible occasion.

If the desire is to raise a healthy herd from condemned animals, and experiment gives color to the feasibility of such a plan, the calves should be removed from their mothers as soon as possible after they are born, placed by themselves, and tested with tuberculin within a month or so.

PRODUCTS OF THE COW.

The milk of animals having been shown to be such an important factor in certain diseases of the human family it has naturally become a serious matter for consideration, especially as to the best methods for handling this product. Having been more or less interested in this question for many years I have inquired in certain quarters concerning the regulations which are adopted by the common councils of some cities. I have made myself acquainted with some of the provisions adopted by some of these bodies, and from them I have compiled the following suggestions with the hope of aiding those who may contemplate similar measures. While gathering this information I have taken pains to inquire how it affected the pecuniary interests of the vendors of the milk, for it is pleasant, if nothing more, in requiring people to observe certain regulations, to frame them so that they may be a pecuniary benefit, rather than otherwise, to those who are most interested. The information I have obtained is somewhat conflicting, some being of the opinion that such regulations are a hardship, while others contend that they are a benefit to the trade. No doubt those who have a desire to elevate the status of their business can see the benefit of a license requiring a standard of excellence in the general management of all affairs connected with the business, while those who are not ambitious as to the elevation of the status of their calling can see nothing but hardship in being required to conform to certain rules and regulations. Were a milk-man to establish a business in any ordinary locality where a license was not required, and he were to adopt some or all of the provisions of the following suggestions, can it be doubted but that he would immediately attract the public attention of his locality and readily get a higher price for his milk, sufficient to go beyond the extra cost of living up to the conditions which he advertised.

The ordinances, as I have compiled them from various sources read something after the following fashion:

Whereas, It is expedient to regulate the milk industry of a certain locality by inspection of the dairies, cattle and cow houses, as well as various utensils used for various purposes in said industry, the following suggestions are made:

First. All cows giving milk for sale shall be clean and free from filth, especially in regard to their udders.

Second. The stable or stables in which any such cow is kept or housed, or in which it is milked shall be kept clean, well lighted and well ventilated.

Third. Such stables shall be lighted by a window or windows of not less than eighteen inches square, or two and one-fourth square feet for each four cows, or any number of cows less than four, if less than that number be kept.

Fourth. There shall be in each stable not less than 200 cubic feet of air space for each cow, and the ceiling, roof or floor above the stable shall be at least seven feet in height, that is, above the stable floor.

Fifth. Each such stable shall have a ventilator constructed through the roof of a sectional area throughout of at least one square foot for each ten cows kept in the stable, with a similar proportion of sectional area in such ventilator for a greater or lesser number of cows.

Sixth. The stable floor shall be at least eight inches above the ground.

Seventh. Such stables shall be whitewashed with lime every six months and shall be whitewashed within two months prior to the opening of such business.

Eighth. Drainage must be provided for every such stable so that no accumulation of water or liquid can take place within ten feet of the stable.

Ninth. Each dairy shall be provided with an adequate supply of pure water.

Tenth. The milk house or building in which milk is kept shall be entirely separated from and at least twenty feet distant from any stable manure heap or other objectionable object, and such milk house shall at all times be kept clean.

Eleventh. Care of utensils. All pails, milk pans, cans and other utensils used for containing or handling such milk shall be thoroughly washed with boiling water and fully cleaned immediately after the same have been used, and no such utensil shall be used, kept or placed in any sleeping compartment or living room of said house. All cans and utensils used in delivering milk to customers shall within one hour after the return of the same to the dairy or milk house or premises of such vendor be so washed and cleaned as aforesaid.

Twelfth. All milk shall immediately after milking be removed to the milk house, there properly strained and placed in open vessels, the temperature to be kept not higher than say 50 degrees, Fahrenheit.

Thirteenth. Vehicles used in the delivery or carriage of milk shall be kept clean and shall not be used at any time for transporting any swill, garbage, or other offensive material. In no case shall any can or other utensil used for containing or handling such milk be washed in water in any trough or other receptacle from which any animals are allowed to drink.

Fourteenth. Stables shall be kept clean. All compost must be removed at least twice daily, once in the forenoon, not later than ten o'clock, and in the afternoon after four o'clock.

Fifteenth. All cows supplying milk to such dairies shall be tested with tuberculin by a competent veterinarian.

In addition to the above, the following ordinance has just reached my headquarters. It is the milk ordinance of the city of San Jose, California.

AN ORDINANCE TO REGULATE THE SALE OF MILK.

Be it ordained by the mayor and common council of the city of San Jose, as follows:

Every person selling milk must have license.

Section 1. It shall be unlawful for any person to sell or offer for sale or have in his possession for the purpose of sale within the city of San Jose any milk, without holding at the time a license in full force issued by the board of health, authorizing such sale.

Conditions on which license shall issue.

Sec. 2. The board of health shall issue free of charge all licenses to sell milk but such licenses shall not be issued except upon the following expressed conditions to wit: That the person to whom the license is issued shall not himself or through the agency of any servant or employé sell or offer for sale or have in his possession for the purpose of sale milk from any diseased cow or any cow fed in whole or in part on still slops or any other food calculated to render the milk of such cow unwholesome or unsuitable for human food; or milk to which water or any foreign substance has been added or which contains more than eighty-seven (87) per cent of watery fluid or less than thirteen (13) per cent of solids, one-fourth of which is butter fat; or milk from which any portion of the cream has been removed unless such milk is represented at the time of delivery as "skimmed milk" and the words "skimmed milk" are distinctly marked in uncondensed Gothic letters of not less than one inch in length upon the outside and near the top of each can, measure or other vessel used in the sale and delivery of such skimmed milk.

Register of the dairy and the person to whom license issued.

Sec. 3. A register shall be kept in the office of the board of health in which shall be recorded the name of the person to whom the license is issued, the name of the dairy or number designation under which the business is to be conducted, if any such there be, of location of the dairy or other place from which the milk is to be supplied and the number contained in the license issued. If a co-partnership desires a license it shall file with the Board of Health at the time of application an affidavit of a member of the co-partnership, stating the names of the persons constituting the firm. And if a corporation desires a license it shall file a certificate by the president and secretary thereof, giving the names of the corporate directors.

Milk wagons to have number.

Sec. 4. All licenses shall contain the conditions mentioned in Section 2 of this ordinance and an agreement on the part of the licensee to faithfully keep and observe the same. Such licenses shall be made in duplicate, one copy of which shall be retained in the office of the board of health. The number contained in the license shall be plainly marked in a conspicuous place on the outside of the wagon conveying the milk, in figures of not less than three inches in height.

Samples of milk for inspection to be furnished.

Sec. 5. Any person having milk in his possession sold or intended to be sold, or in process of delivery for the use of any resident of the city of San Jose shall, on demand, deliver to the health officer or any member of the board of health free of charge for the purpose of inspection a quantity of such milk not exceeding a half pint taken from each can or other vessel in which the milk is contained, if so required. The health officer shall make a careful and thorough examination of samples taken, and if, upon such examination the milk shall not be found of the standard quality of purity and wholesomeness required by Section 2 of this ordinance, he shall file with the board of health a report in writing the specific particulars in which it is deficient and the board of health shall thereupon revoke the license of the person so found violating the conditions upon which said license was issued. Immediately upon filing said report the health officer shall make a complaint before the justice of the peace in and for the city of San Jose against the person or persons so found violating the provisions of this ordinance and no license shall be issued to such person or persons whose license has been revoked and against whom complaint has been made before the city justice, as aforesaid, until final acquittal or conviction upon said complaint and the payment of a fine or the serving of a term of imprisonment has been completed.

Veterinarian and health officer to inspect dairies.

Sec. 6. It shall be the duty of the health officer and the board of health to visit from time to time and inspect all dairies and other places from which milk is supplied and compel the keeping of such premises and all vessels and vehicles used in the business in a perfectly clean and sanitary condition, and any license may be revoked by the board of health for a failure to comply with its directions in relation to the matters.

N. B.—Another ordinance makes the veterinary inspector a health officer. (Grange.)

Persons violating this ordinance to be prosecuted.

Sec. 7. It shall be the duty of the health officer, the chief of police, and all police officers to detect and prosecute the persons violating any of the provisions of this ordinance.

Penalty.

Sec. 8. Any person who shall violate any provision of this ordinance shall upon conviction be punished by a fine of not exceeding $100 or by imprisonment in the city prison not exceeding thirty days.

Sec. 9. This ordinance shall take effect April first, 1895.

The following communication speaks for itself and is substantially the same as others from different quarters upon the same subject:

San Jose, Cal., 31st March.

E. A. A. Grange, State Veterinarian, Lansing, Michigan:

Dear Sir—Your communication of inquiry * * * has been sent to me * * * with the request that * * * I will send you a copy of our city ordinance and also one of our county ordinances appointing a county veterinarian and defining his duties, and in explanation will say that the inspector for the city and county is paid for by both governments, i. e., it is a dual office and until recently the inspector has been a member of the board of health * * * Our milk dealers take very kindly to the order of things; about three times a week we take up milk samples, and require them to show by the Babcock test a percentage of at least 3 per cent in butter fat, failing we revoke their license and prosecute them for selling diluted products; we have only had to make four arrests in a year and we have a hundred and fifteen milk licenses issued. A license costs nothing but every applicant must have a clean bill of health for his herd showing that every individual in his herd has been subjected to the tuberculin test, and without such license they are not permitted to sell any of the products of their stock. Milk has not improved in the price but the dealers feel that they are no longer objects of suspicion and that the merit of their products is justly measured and that the public bulletins of the result of the tests made a basis from which the public can estimate their worth * * *

(Signed) H. A. SPENCER, V. S.

PREPARATION OF MILK FOR INFANTS AND INVALIDS.

In the New York Medical Journal, February 4, 1893, Dr. Koplik describes the method used by him for several years in the Good Samaritan Dispensary in New York for the preparation of infants' food. The milk supply is derived from a reliable leading dairy and delivered in refrigerator tubs. The simple pasteurization of milk is useful, provided the milk is immediately cooled and used within twenty-four hours. If not afterwards cooled the pasteurization seems to increase the liability to fermentation. In thorough sterilization the danger to be avoided is the coagulation of the albuminoids or burning of the milk. Some authorities claim that the sterilization makes the milk too indigestible, while others claim that the digestibility is not affected, provided the sterilization is properly conducted and the milk is thoroughly stirred during the process. The latter process requires more care than the former.

Pasteurization can be easily carried on by any housewife.

The simplest plan is to take a tin pail and invert a perforated tin pie plate in the bottom, or have made for it a removable false bottom perforated with holes and having legs half an inch high, to allow circulation of the water. The milk bottle is set on this false bottom, and sufficient water is put into the pail to reach the level of the surface of the milk in the bottle. A hole may be punched in the cover of the pail, a cork inserted, and a thermometer put through the cork, so that the bulb dips into the water. The temperature can thus be watched without removing the cover. If preferred, an ordinary dairy thermometer may be used, and the temperature tested from time to time by removing the lid. This is very easily arranged, and is just as satisfactory as the patented apparatus sold for the same purpose.

In addition to the above:

Professor H. L. Russell, of Madison, Wisconsin, gives in bulletin 44 of the Wisconsin Experiment Station, page 17, the following directions for pasteurizing milk either for general or infant use:

1. Use only fresh milk (not more than 12 hours old) for this purpose.
2. Place milk in clean bottles or fruit cans, filling to a uniform level. (If pints and quart cans are used at the same time an inverted dish or piece of wood will equalize the level.) Set these in a flat bottom tin pail and fill with warm water to same level as milk. An inverted pie tin

punched with holes will serve as a stand on which to place the bottles during the heating period.

3. Heat water in pail until the temperature reaches 160° F.; then remove from source of direct heat, cover with a cloth or tin cover and allow the whole to stand for half an hour.

4. Remove bottles of milk and cool them as rapidly as possible without danger to bottles and store in a refrigerator. * * * Milk treated in this way ought to keep perfectly sweet for several days.

For further information as to the handling of milk I beg to refer the reader to Prof. C. D. Smith's Bulletin No. 134, Michigan Experiment Station and the Government Year Book for 1894.

OTHER DISEASE OF CATTLE.

In connection with the communicable diseases of cattle it becomes my unpleasant duty to have to report the prevalence of a disease, brought under my notice last autumn, which from a local standpoint was of a virulent nature, in as much as it destroyed in numerous instances certain glands of the body, notably the udders.

This disease was reported as existing to a considerable extent in Monroe county, and I was directed to investigate it. On proceeding to the point where the report came from I was taken by the health officer to a certain farm. There I examined a number of cattle which had been affected with the disease. It is unfortunate to a certain extent that the disease runs its course with more or less rapidity, and the information I was able to obtain was only such as could be gathered from a casual observer who owned the animals, and who from time to time referred to some of the hired help in answer to some of my questions. This disorder, I may state, was popularly believed to be cow-pox, and while it is possible that future investigation may cause me to form an opinion in accordance with the accepted idea of the locality, I may say that there are some features concerning which differ so much from the ordinary cow-pox that the question has arisen in my mind whether the two diseases are identical.

It is perhaps unfortunate that the bacteriologist is unable with known methods (known to the writer) to diagnose cow-pox. It is true that with the aid of a microscope and other accessories a germ can be shown of a certain description, but a similar if not identical one can be shown under other conditions, which are as far removed from cow-pox as one disease can be removed from another. This defeats the bacteriologist in forming an opinion because he is not able to identify the germ of this disease by any known method. So that we must view the conditions and form our opinions from the evidence we can gather by macroscopical and clinical observation.

Perhaps at this stage and to show the difference between these two diseases as they have presented themselves to me it may be well to describe the salient features of ordinary cow-pox, briefly. In the first place, it usually attacks young animals and the part which is selected for invasion is the udder, although we are informed by far eastern writers that the disease in India sometimes disseminates itself over other parts of the body.

In temperate zones, at all events, the disease usually manifests itself by a faint blush upon the udder which in the majority of instances is to some extent, denuded of hair. This blush soon deepens into a redder tinge and eventually becomes a vesicle, which in its turn, becomes converted into a pustule and the sack, during its progress, becomes umbilicated or cupped, as it were. We may find a numerous group of these vesicles upon each gland or there may be only a few of them. It, as a rule, runs a definite course and all writers that I have consulted state that prognosis should be favorable, indicating thereby that the disease will eventually terminate in resolution and the gland not be interfered with as far as the future is concerned. In the more aggravated cases there may be slight fever, indicated by a rise of temperature, capricious appetite, constipation, and general dullness for a little while. In the course of a few days the pustules will burst and the sore will in favorable cases become a scab and eventually disappear, probably in the course of a couple of weeks after the first manifestation of the symptoms of the disease.

We do, however, find that successive groups of these pustules will make their appearance in which case it will hang about the animal for five or six weeks.

The disease which my attention has been called to the past fall is of a far more virulent nature than the one just described. While I have not had an opportunity to watch its progress from start to finish, yet I have gathered considerable information from the owners of afflicted animals. I have to say that as far as my information is concerned, I have gathered it in various parts of this State as well as neighboring states, all of which I have to add to those cases which I was fortunate enough to see.

This disease usually manifests itself by the cow becoming restless during the operation of milking, and in a great many instances it is difficult, if not impossible, to extract the fluid from her in a proper manner. Then, we soon have the sore upon the udder, which in some instances that were brought under my notice had extended to the teat itself. It was stated to me that these sores were at first small but after a time, say three or four or five days, they became larger until they had assumed, in some instances where I saw them, as great in magnitude as, say a silver dollar. It was my opinion that these massive scabs were the result of smaller ones coalescing or running together.

A remarkable feature in connection with the disorder was its apparent tendency to attack the interior of the gland, and in one animal that I can call to mind, a magnificent Holstein, was affected so badly that my opinion after examining her carefully, was that her udder would never secrete good milk again. The owner, himself, had formed that opinion previous to my visit. Upon this farm I saw ten animals out of about twenty that were seriously affected. In a few instances one-quarter or even two-quarters, might be giving pure milk, but in the majority of cases the cow appeared to me to be practically ruined from the dairy standpoint. The owner stated that he estimated his loss at being as much as $500, and I must admit, after viewing the situation, I thought he was placing a low estimate upon it.

The glands in these cases were hard, indurated masses, reminding one of the feel of a hard, rubber ball, or wooden like, and the small quantity of fluid which could be extracted from them was most unlike good milk, in some instances it being thin and watery, in others pus like, and in still others a good deal of blood was mixed with the discharge.

During the winter months of the year it has been my privilege to address farmers' audiences in various parts of this State, and, feeling that there was more or less disturbance among the dairy cattle of the State, I selected as my topic, "The Milk Gland and its Diseases." At the close of my remarks in every instance that I can call to mind I was asked numerous questions concerning the disorder which I have endeavored to describe. At these meetings I gathered considerable fresh information which led me still further to think the disease might be the result or another cause than that which produces ordinary cow-pox. I was informed by intelligent men that their cows had been affected, and in some instances the affected quarter would assume that condition which is usually spoken of as gangrene, or mortification, and drop off. In other instances the gland would suppurate and large abscesses form which if not lanced would burst of their own accord.

Now, as far as I can learn it is not a common thing, at all events, for ordinary cow-pox to attack the interior of the gland. It is certainly the exception and not the rule, while in the disease which I am speaking about, it was invariably the rule. This marked difference in the two complaints causes me to say that if the disease in question should prove to be occasioned by the same organism, assuming that it is an organism, it was of a most virulent nature, worse than has been described in the writings of any investigator which I have consulted. While this disease is disastrous in its effects if allowed to run its course, yet experience with disorders of this nature has led me to believe that it can be controlled in a manner which would cause the cow to become profitable to her owner from the dairy standpoint; on which account I am inclined to recommend that the disorder should be investigated from a curative point of view, as I believe it has cost farmers of this State many thousands of dollars during the past season.

It appears that the complaint is one which prefers the summer months or early autumn for invasion of the animal. I say this because I have not heard of an outbreak since the cooler weather of the autumn set in.

Like other complaints of this nature the maximum virulence is reached in a certain season, and it is possible the maximum was reached last year, in which case it may decline, and not be so prevalent or disastrous in its effects during the coming season, but it must not be forgotten that the opposite may be the case, and that it may prevail even over a more extended territory.

SHEEP.

Reports concerning this species of domestic animal indicate that serious disorders of them are quite prevalent throughout the State. While I have done a good deal of correspondence with the owners, thus pursuing my investigations at arm's length as it were, yet I have had sufficient personal investigation to show that the disorders of these animals are worthy of most careful consideration.

During my investigations I have discovered no less than five different parasites invading certain parts of these animals; three of them confining their ravages to the bowels, while the remaining two prefer the lungs for invasion. Those which attack the bowels are by far the most prevalent, the ones which attack the lungs having only made their appearance in a few instances.

EXPLANATION.

TÆNIA *Expansa*, Rud.

Plate I.

Figs. 1 and 2. Young tape-worms, natural size.
Fig. 3. Head end of tape-worm, drawn to show vermicular contractions when living.
Fig. 4. Head, top view: *a, a*, the suckers or cups, by which the worm attaches itself to the intestinal walls.
Fig. 5. Head, side view: *a, a*, suckers; *b, b*, folds in the neck; *c, c*, the first segments.
Fig. 6. The large end of a young tape-worm: *a, a*, segments which are not mature enough to drop off; *b, b*, segments ready to pass away from the worm.
Fig. 7. Segments, or proglottides found, separate from the worm.
Fig. 8. An adult tape-worm, drawn in sections at regular intervals apart: *a*, head.
Fig. 9. A fragment of another worm, which is not only slightly larger, but whose segments are shorter and broader.

The specimen shown in fig. 8 could have assumed very much the same form when alive as is seen in fig. 9.

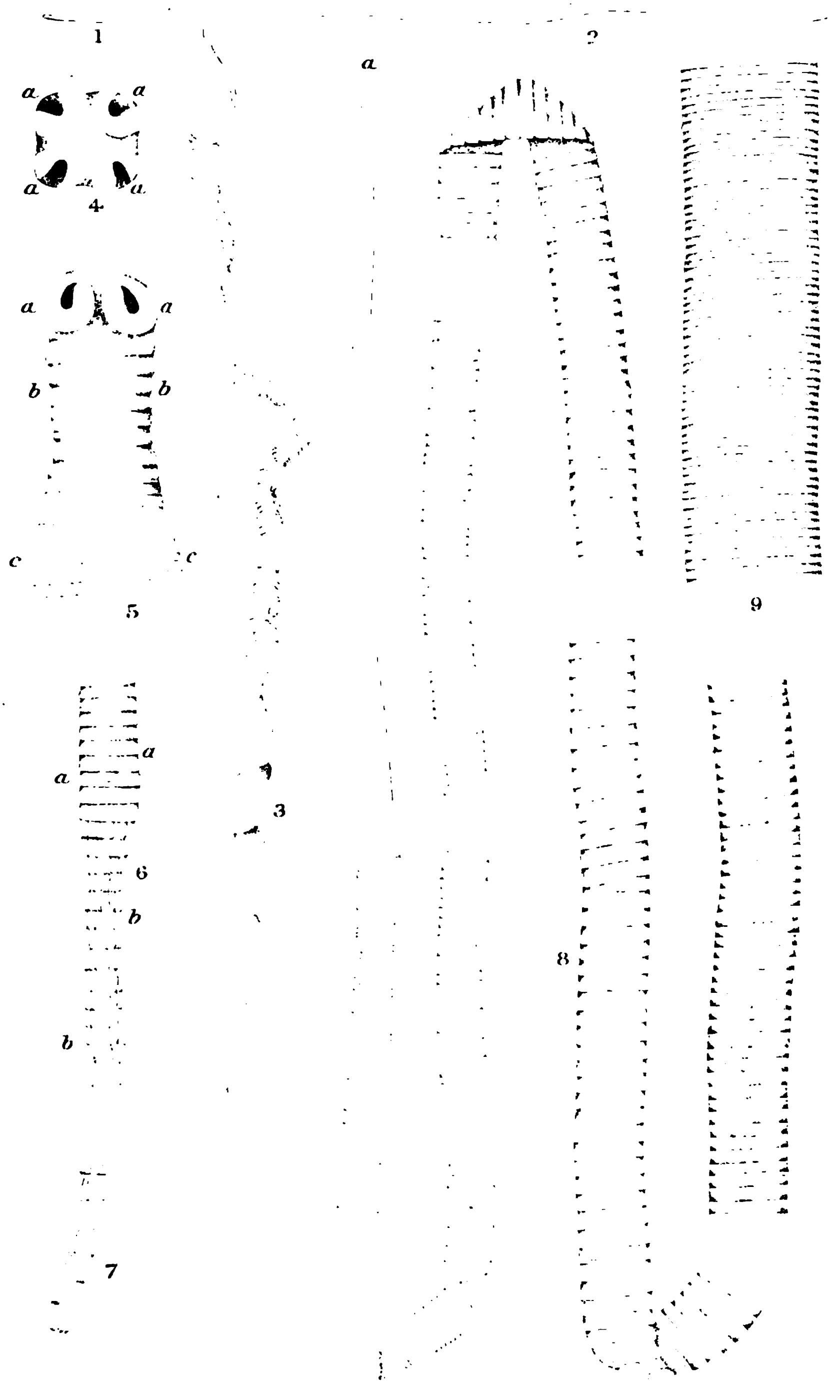
EXPLANATION.

TÆNIA EXPANSA EMBRYOS.

Plate II.

Fig. 1. Embryos magnified and flattened under cover-glass.
Fig. 2. A single embryo and its envelopes somewhat flattened.
Fig. 3. The same greatly flattened: *a*, the thick, oily mass between the inner and outer covering.
Fig. 4. The same with outer envelope ruptured: *a*, the outer envelope; *b*, the inner; *c*, oil globules; *d*, the embryo and its pyriform apparatus.
Fig. 5. Embryo, with three envelopes.
Fig. 6. Embryo escaped from ruptured inner coat: *a*, the fringed cap-like covering; *b*, the bladder-like sac protruding from it; *c*, the six-hooked embryo.
Fig. 7. A younger embryo, in which the bladder portion has not burst from the cap; *a*, the cap; *b*, the embryo.
Fig. 8. Three young *tænia* which show no trace of segmentation.
Fig. 9. A young *tænia* which is beginning to segment.
Fig. 10. A head of young specimen showing a peculiar loop in it.

First amongst those which attack the bowels is a tape worm known to science as *Tænia Expansa* (Plates I-II). I have invariably found this worm in the small bowel, and, according to my investigation, it has varied in length from one foot to fifteen feet and has been about a half inch in width at its widest part, tapering gradually towards the end, the head being considerably smaller than any other part. It is made up of



Geo. Marx, del.

A. Hoen & Co. Lith. Baltimore.

TAENIA EXPANSA,
(The Broad Tape-Worm.)

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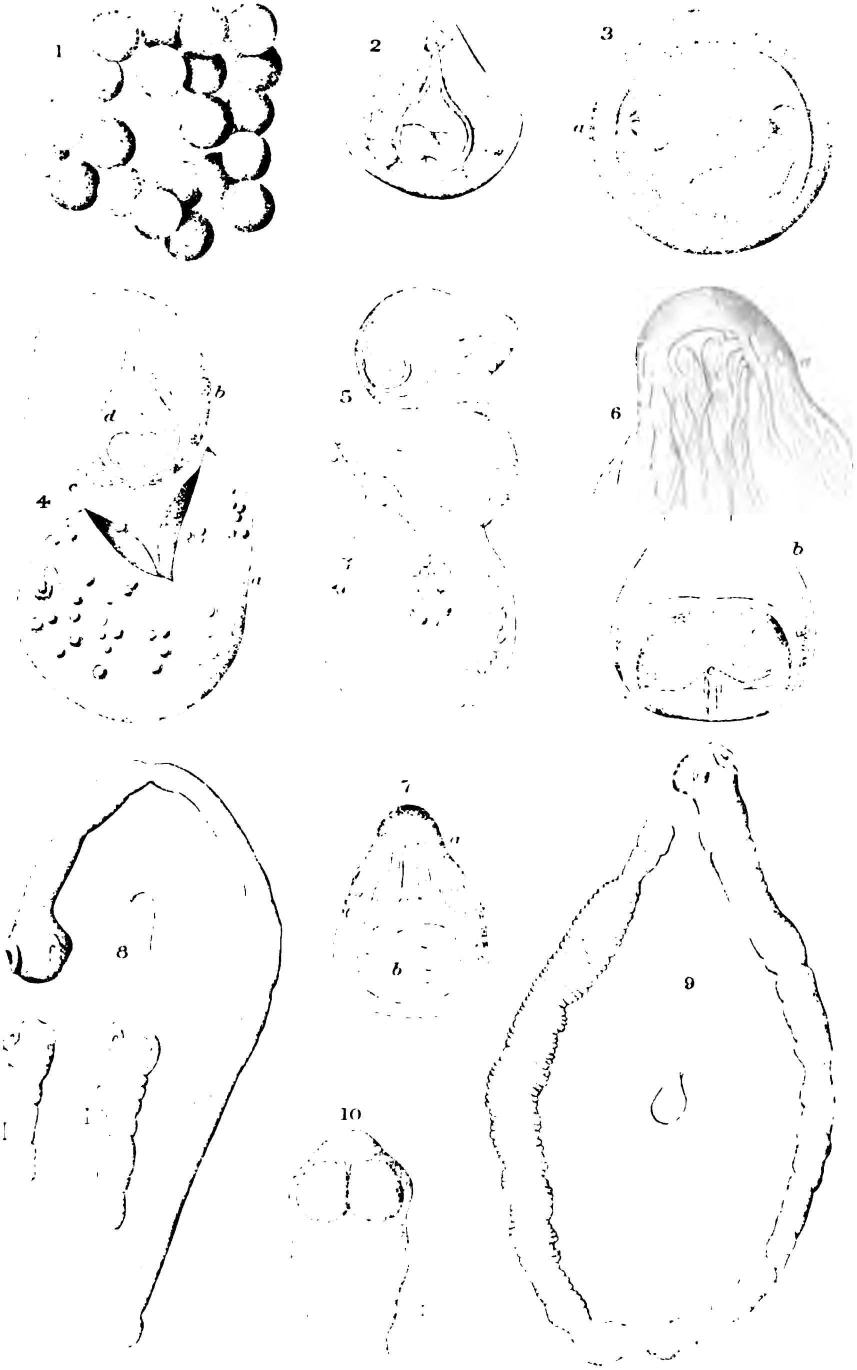
PLATE II.



Geo. Marx, del.

TAENIA EXPANSA,
(Young Stages.)

A.Hoen & Co. Lith. Baltimore.

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innumerable segments which, when passed through the bowels, sometimes appear single, and resemble little white maggots as they adhere to the droppings from the animal. Sometimes several feet of a chain of maggots as they appear will be voided at one time. This paracite has been more or less investigated by the Bureau of Animal Industry at Washington, and to it we are indebted for the following description:

"The entire worm measures about 5 yards in length, its width varying from 1-25 of an inch to ¾ of an inch, its thickness being about 1-10 of an inch, the dimensions greatly depending upon the contracting condition of the worm when measured and on its state of preservation. An adult specimen taken from the sheep may measure less than four yards or may slightly exceed five, but they never, in this country at least, attain that gigantic measurement of 100 feet ascribed to them by European observers. The head is somewhat larger than the neck and measures 1-25 of an inch in width. It is smooth on the end and has four suckers directed anteriorly. Its neck, or that portion of the worm immediately succeeding the head, which is segmented, is short or lacking. The body of the worm is apparently made up of a series of very short but extremely wide joints, which vary in length and width in the successive portions of the body. The first rings of the tænia are very short and narrow, others are longer but are also broader than long. Those segments which are about two-thirds the entire length from the head are the longest. From these to the end they become gradually shorter and wider. In width, the segments gradually increase from the head to the end. When first procured the texture of the worm is usually opaque and white, and it is only by allowing them to stand in water that they become transparent enough for study. It can then be seen that each segment is bilaterally symmetrical, that in each half is an independent set of genital organs. These become apparent at a little distance from the head and show in their best development about half the entire length from the head. From this point on, the segments become more and more opaque to the end."

The rest of the description of the worm is so technical that it is perhaps unnecessary for me to describe it here. Should the reader desire, however, to follow this question further, let him refer to page 114 of "The Animal Parasites of Sheep," by Dr. Curtice of Bureau of Animal Industry, Washington, D. C.

DISTRIBUTION OF THE WORM.

I have heard of this worm being distributed in many sections of the United States as well as Canada. Indeed, it is one of the best known of the internal parasites of sheep, and is more abundant in summer and early fall than any other season of the year. The prevalence of it in sheep was first brought under my notice in 1892 when some sheep were sent to me from Lake View in this State, which were supposed to be suffering from some mysterious disease. From any account which I have been able to obtain, it would appear that the disease had not been recognized in this State previous to that time, although it is highly probable that it invaded sheep for many years previous. It is believed to have been introduced into this country with sheep which harbored it, and has been passed along from them to others year after year.

With regard to the life history of this kind of parasite it may be interesting to note that as a rule it requires two animals before the circulation or life history is complete. The one in which the worm exists as a tapeworm is called the host, while the other animal in which it exists as a little sac is called the intermediate host. In some instances the intermediate host has not been discovered, and it may be that in these instances it is not necessary that an intermediate host should exist.

From a somewhat extended experiment conducted by Dr. Curtice it appears that an intermediate host is not absolutely necessary in the case of tænia expansa. He states, amongst other things, in his investigations, that the life history is only incomplete in that portion of the life of the worm which it passes outside of the life of the host. Just exactly what happens to the embryo containing the egg between the time that it escapes until it is again found in the sheep as a little head with four suckers and a short tail-like appendage, is not known, but may be inferred with some degree of accuracy. It is not possible to develop the embryo in water, or feed them and produce an infection in sheep. So it has been suggested that these forms may pass a portion of their existence in some of the minute animals or insects which inhabit the grass and water of sheep farms. But it has not been proven that this is necessary, and it has been stated that the disease has been found in sheep which have been fed entirely in stalls, but usually in the youngest of the flock.

Whatever may be the accurate life history of this parasite, it is important to recognize the disease in its earliest stages, for experience has led the writer to believe that the adoption of curative measures in proper time will save many if not all animals which might be affected with it.

The disease may be discovered by finding little white, oblong tapeworm segments, resembling maggots or two or more maggots gummed together, as it were. These segments adhere tenaciously to the droppings of the animal, but it must be remembered that these segments are only found after the tapeworm has become fully grown, when it sheds its joints. The sheep or lamb, oftener the latter, may be affected with a variety of enteric or bowel symptoms. Sometimes the creature becomes much dejected and will hang behind the flock, the mucous membrane lining the nose and eyes becoming pale in color, the fleece dry and harsh. The animal will often walk with a staggering gait, and things go from bad to worse until the poor creature grows weaker and weaker, diarrhœa sets in, which becomes more and more pronounced until death closes the scene.

The presence of the worm cannot always be recognized by symptoms, and it is perhaps unfortunate, as we are obliged to recommend a line of treatment without actually knowing that the disease does exist; but fortunately the line of treatment which we shall recommend will not do harm to the animal although the parasite may not be there, so that we have lost nothing except our time in administering the medicine, and the cost of it, the latter is very trivial.

To illustrate how far the disease may go without manifesting itself by symptoms, I can call to mind having visited a flock, a number of which were believed to have previously died of this disease. There were about sixteen lambs in a lane, all of them vigorous and in the best of spirits.

I suggested to a good judge of sheep who was with me that he might pick out the most vigorous one of the lot to see if it had the disease, the animal being finally selected. We killed it and held a post-mortem. I laid open one of the smaller bowels and there I counted nine immature tapeworms, lying side by side. It is true that they had not developed to that extent that they caused the creature any particular inconvenience, but from experience one might say that nothing could be more certain than the death of that sheep from tapeworm, provided matters were permitted to run their usual course.

TREATMENT.

Before giving the sheep worm remedies it may be well to prepare them by withholding a certain amount, say half of the feed the night before the medicine is to be given, and the remedy is thought to be still more effectual if the animal is stinted in its water for at least twelve hours before the medicine is given. Fluids should be given at one dose and the animal should be allowed time to swallow it slowly. It is better not to turn them out after the medicine has been given, and the more they are watched to see if worms are voided, the better. If worms are not voided after the first dose, it may be repeated the second day, and I have repeated it even a third time, allowing a day or two to intervene.

The medicine which I have used and give preference to is spirits of turpentine, which may be prepared for administration by taking one part of the turpentine and adding to it sixteen parts of sweet milk. Shake this well and use as a drench. The dose of the mixture for lambs from three to six months old is about two ounces; six months to a year old about three ounces, and from a year old upwards about four ounces. I have occasionally given larger doses than these, increasing them about a half, without any apparent ill effect; indeed, in some instances, I have thought that the larger dose was more effectual. One dose will often be sufficient, but if it is not, repeat as above described.

To give the medicine, let a careful assistant place the animal upon its haunches, holding the body between his knees with the face outwards. The mouth should be gently opened by pressing the thumb on one side and the fingers on the other around the lower jaw. The medicine should then be poured slowly in, from a long necked bottle. If the animal exhibits any desire to cough, let the head go immediately and let it recover from the cough before attempting to give any more of the dose. The coughing indicates that a few drops of the medicine have gone the wrong way, and if we persevere in pouring it down under such conditions we may do more harm than good.

Many other remedies have been recommended. Pumpkin seeds, among other things, have been highly extolled; but my experience with them has been anything but flattering to the drug. Powdered areca nut has been recommended for tapeworm, but I cannot say that it has proved as effectual as the turpentine in my hands. Oil of male fern in doses of ten to twenty drops, given in a little molasses and water, and followed the next day by a purgative, say two to four ounces of castor oil, is good. Many tapeworm remedies are recommended, but it must be remembered that to be effectual in saving the life of a large percentage of the animals they must be given before the parasites have weakened the constitution of the host, to that extent that it is unable to battle against the various difficulties which usually accompany such disorders, in the shape of general debility, diarrhœa, and the like.

For a description of the tœnia expansa in its various forms let me refer the reader to plates Nos. 1 and 2, to which are attached explanatory notes.

EXPLANATION.

STRONGYLUS CONTORTUS, Rud.

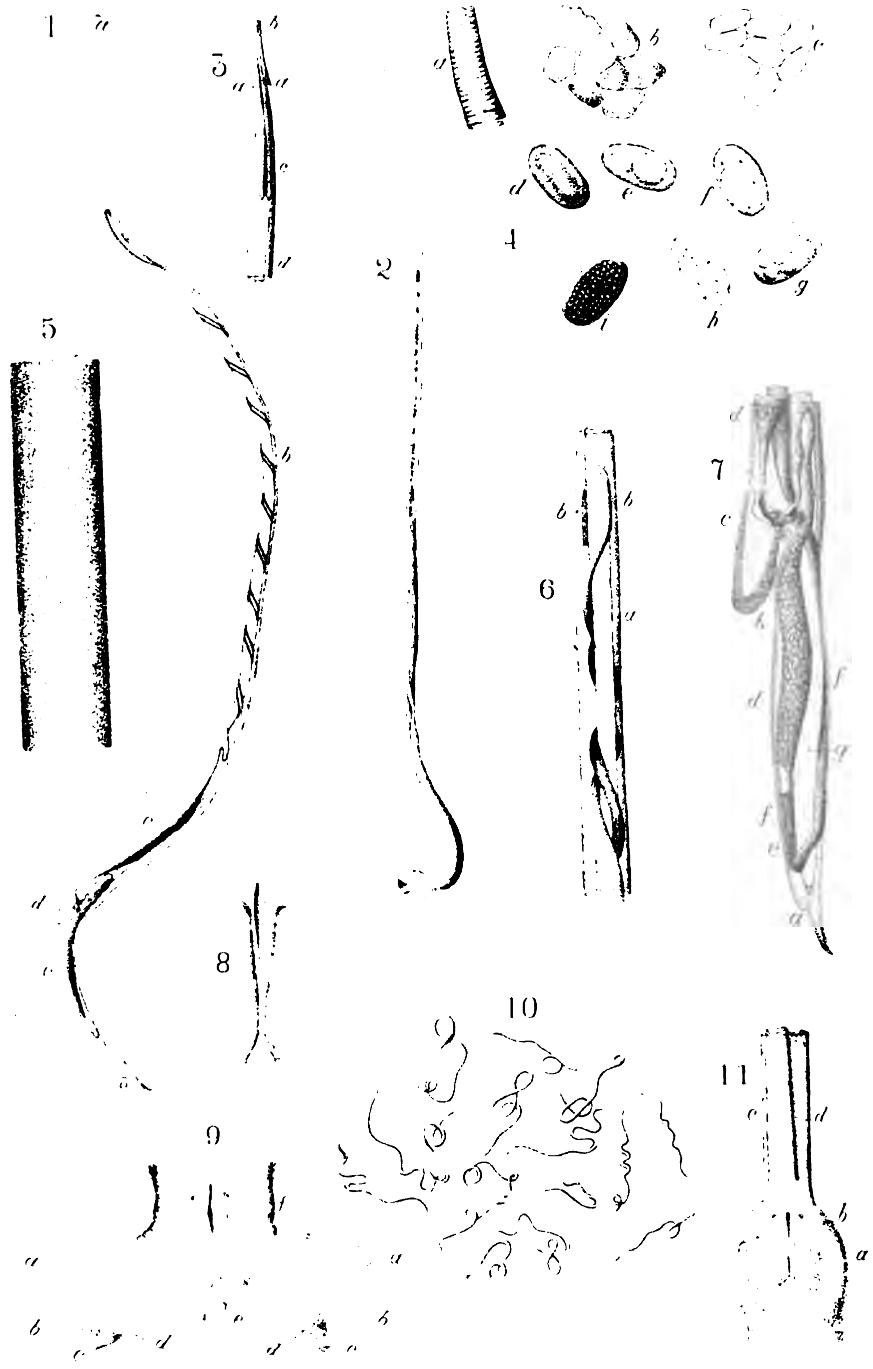
Plate III.

Fig. 1. Adult female, ×6; *a*, head; *b*, ovaries wound around the intestines; *c*, *c*, uteri; *d*, a large papillæ, just in front of and covering the vulva; *e*, anus.
Fig. 2. Adult male, ×6.
Fig. 3. Head; *a*, two barb-like papillæ; *b*, mouth; *c*, œsophagus; *d*, intestine.
Fig. 4. Eggs, highly magnified: *a*, eggs before they have left the ovaries; *b*, eggs showing nuclei; *c*, eggs after they have passed through the oviduct; *d*, egg with one cell; *e*, with two; *f*, with four; *g*, with eight; *h*, with many; *i*, egg as it is laid.
Fig. 5. Skin, showing nine of the eighteen longitudinal lines.
Fig. 6. Portion of female: *a*, the intestine; *b*, *b*, the ends of the ovaries.
Fig. 7. Caudal end of female: *a*, the annus; *b*, the vulva; *c*, vagina; *d*, *d*, uteri filled with eggs; *e*, oviduct; *f*, *f*, ovary; *g*, intestine.
Fig. 8. Spicula, enlarged.
Fig. 9. Bursa, expanded to show costæ: *a*, ventral; *b*, ventro-lateral; *c*, lateral; *d*, dorso-lateral; *e*, dorsal; *f*, spicula.
Fig. 10. Group of adult males and females, natural size.
Fig. 11. Caudal end of male: *a*, bursa; *b*, spicula; *c*, seminal reservoir; *d*, intestine.

Strongylus contortus is a round worm found in sheep in many parts of Michigan, in some instances creating sad havoc in the animal which they attack. It appears to prefer the fourth stomach of the animal as its habitat rather than any other part of the economy. The disorder produced by this worm is familiarly known in the more southern latitudes of this country as Lombriz, a somewhat ambiguous term, inasmuch as it is a Spanish word meaning a worm. The parasite produces characteristic symptoms which can be recognized with more or less certainty by those who are familiar with the disorder, although it is perhaps unfortunate that they closely resemble the symptoms produced by other worms in the intestines, and, indeed, are often accompanied with other worms, so that it becomes a matter of some difficulty for the veterinarian to decide which of the two is producing the greater disturbance.

The sheep which is affected with them will be seen to hang behind the rest of the flock and have a marked expression of general languor. The head will hang and ears will droop, there will also be an expression of general debility. The bowels will frequently be costive but in many instances give way to diarrhœa; the appetite of the animal will be capricious. In some instances I have noticed extreme prostration, even to that extent that the animal lay upon its side, little more than a lifeless mass.

PLATE III.



Geo. Marx, del.

A. Hoen & Co. Lith. Baltimore.

STRONGYLUS CONTORTUS.
(The Twisted Stomach Worm.)

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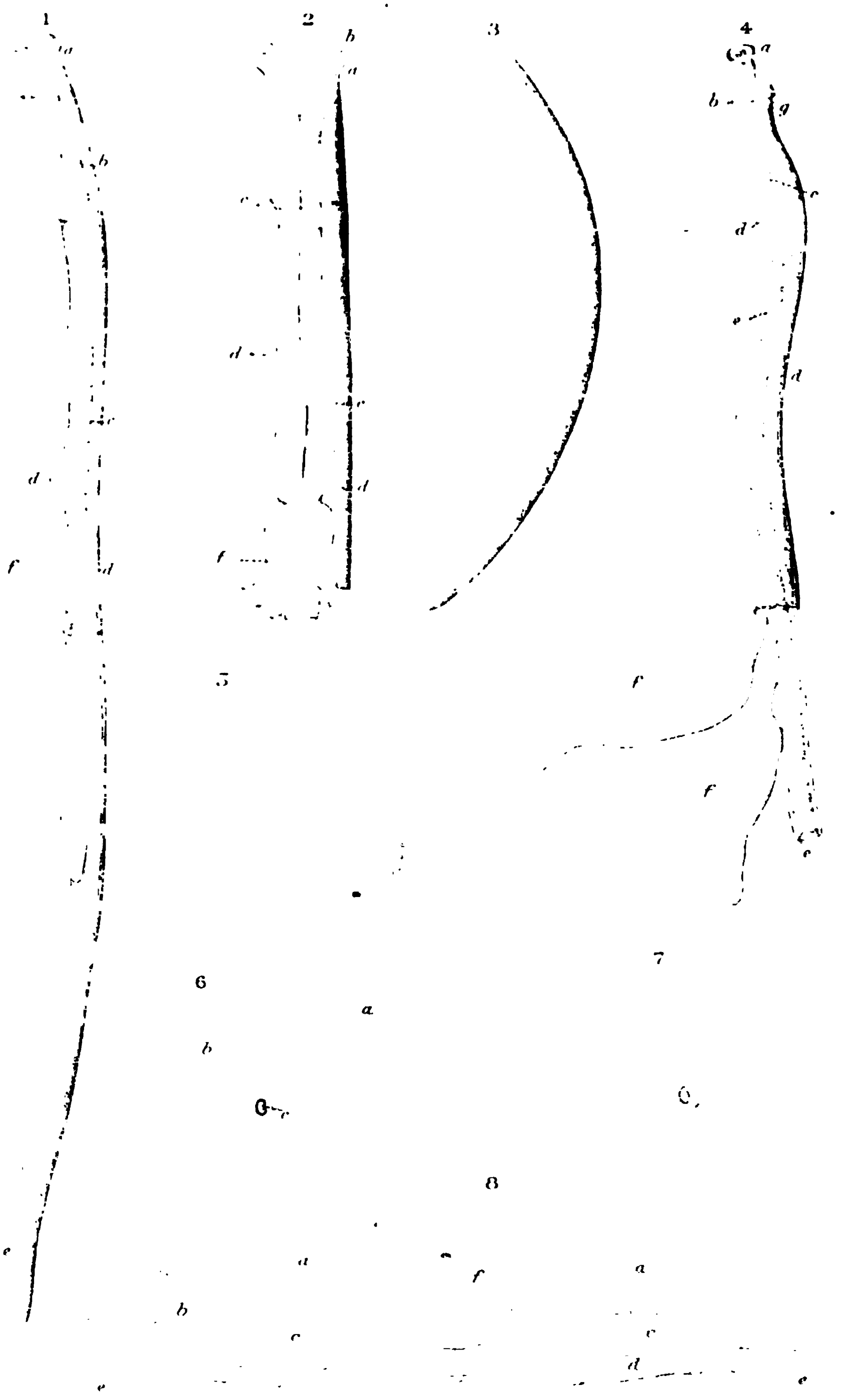
PLATE IV.



Haines, del.

A. Hoen & Co. Lith. Baltimore

ŒSOPHAGOSTOMA COLUMBIANUM.
(Young Stages.)

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If there is a special desire to diagnose the disease with more certainty, a careful examination of the fæcal discharges from the animal, by the aid of an ordinary magnifying glass will sometimes reveal the presence of the worm. Should it not be found and the animal eventually die from an unknown complaint, a post mortem should be held and attention directed to the fourth stomach where, if these worms are the cause, they will be found in vast numbers; their movements can be readily detected as they wiggle about in the organ, appearing to some extent as if attached to the mucous membrane of it. Those that I have observed present a somewhat chocolate hue and look like so many brown hairs about, say for convenience sake, an inch and a half long. They vary considerably, however, as far as their length is concerned.

LIFE HISTORY.

It is believed that sheep contract this disorder by consuming the eggs which fall to the ground along with the worms which have infected other sheep and that when these eggs arrive at the fourth stomach of the sheep, finding a suitable habitat, they develop there. A description of the parasite is exhibited on plate No. 3.

TREATMENT.

I have found the spirits of turpentine and milk more effectual with this disease than any other agent which I have used. Add one part of spirits of turpentine to 16 parts of milk. Dose two to four ounces for each animal, according to the age of the patient, repeated in two days if necessary, and again in two days after that. The disease may be prevented to a large extent by requiring sheep to eat out of mangers and drink from troughs which have not been contaminated by affected sheep. The medicine should be administered in the same manner as was described in the last disease.

NODULAR DISEASE OF THE INTESTINES.—PLATES IV-V.

EXPLANATION.

Æsophagostoma Columbianum, Curtice.

Plate IV.

Fig. 1. Worm in third stage, ×60: *a*, head, with chitinous armature; *b*, œsophagus; *c*, intestine; *d*, unicellular glands; *e*, anus; *f*, line denoting natural length.

Fig. 2. Cephalic end, lateral view, ×150: *a*, chitinous cup; *b*, one of the six cephalic papillæ, (these are slightly distorted); *c*, side view of the neck-fold, under which the gland-ducts, *d*, *d*, open on the ventral line; *e*, œsophagus; *f*, intestine.

Fig. 3. Worm in first stage when 0.23 mm. long. No internal organs were seen in this specimen.

Fig. 4. Cephalic end, ventral view: *a*, head; *b*, neck-fold, near, which are the neck papillæ *g*, *g*; *c*, œsophagus; *d*, *d*, unicellular glands, which open under the fold *b*; *e*, intestine; *f*, *f*, glands.

Fig. 5. Worm inclosed in its cyst.

Fig. 6. Tumor from which the cyst in Fig. 5 was taken: *a*, surrounding tissue dissected from cæcum; *b*, fluid-filled space; *c*, capsule with inclosed worm.

Fig. 7. Older tumor. This differs from tumor of Fig. 6, in having a movable cheesy mass. These tumors are distorted by compression, which makes them too flat. Figs. 6 and 7, and Fig. 3, Plate XXVI, present three stages in the disease, as seen in fresh tissues under low magnifying powers.

Fig. 8. Section of an advanced tumor: *a*, mucous membrane; *b*, submucous; *c*, inner muscular layer; *d*, outer; *e*, serous membrane; *f*, the cheesy mass of the tumor in which is a small section of the worm. This presents a more advanced stage of the disease than Fig. 2, Plate XXVI.

EXPLANATION.

ÆSOPHAGOSTOMA COLUMBIANUM, Curtice.

Plate V.

Fig. 1. A piece of mucous membrane taken from the cæcum, surface view, natural size. The patch of dots scattered uniformly over the surface represents intestinal glands; the irregularly scattered larger dots and elevations are the young worm tumors in their first stages.

Fig. 2. A section through a worm tumor in its younger stage: *a*, *a*, *a*, mucous membrane; *b*, submucous connective tissue, in which are *c* arteries and *d* veins; *e*, the tumor, which is made of connective tissue cells and their nuclei, packed closely together; near its center is the worm cavity *f*, with a piece of the worm, which is surrounded by a section of a special capsule; outside of this is a thick membrane, formed from the surrounding material.

Fig. 3. Small tumor dissected from the cæcum: *a*, the outside capsule filled with fluid, in which is *b*, a hard, cheesy mass; *c*, the worm in its capsule, which has been pressed out of the cavity in the mass *b*. This presents a more advanced stage of the disease than Fig. 7, Plate XXV.

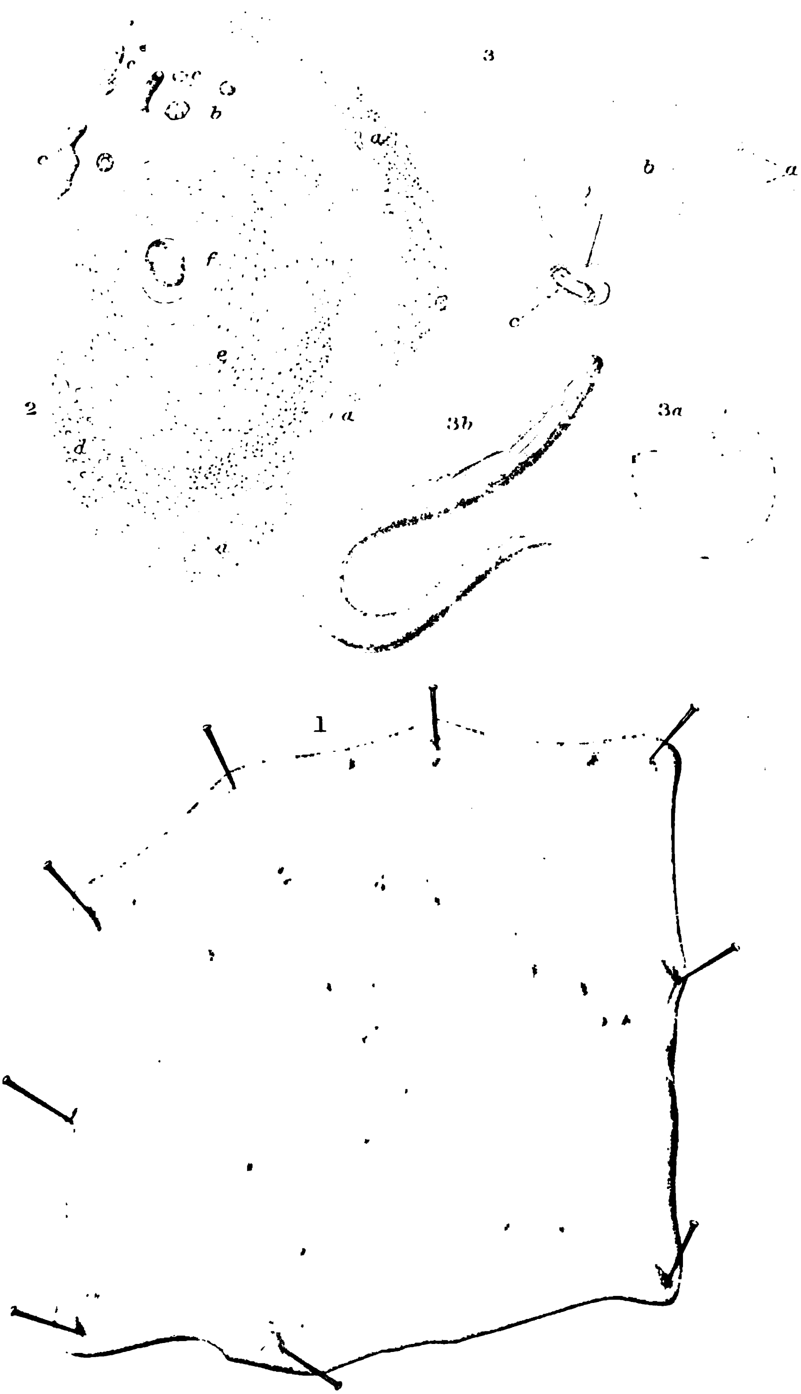
Fig. 3*a*. The ruptured capsule.

Fig. 3*b*. The worm near the end of its second stage about to moult.

On several occasions I have been consulted concerning an outbreak of disease in sheep, the owners stating that the animals seemed to sicken and die without any apparent cause. I have in some instances investigated these outbreaks and have found the walls of the bowels from beginning to end, affected with a peculiar beaded appearance which was most striking. I have noticed that by drawing the small bowel through the fingers a sensation would be produced upon them which would remind one of a string of beads where the beads were a few inches apart. In other instances the nodule will assume considerable dimensions, being as large as a bean. When cut into the nodules will be noticed to contain green, cheesy like substance, which has reminded me in some instances of the meat of the green pea. This disease may invade the economy of an animal to a considerable extent without apparently doing much harm. But when the bowels are as badly affected as I have seen them it is pretty evident to me that they were the cause of the sickness and death of the animal.

It is quite unfortunate that we cannot diagnose this disease with anything like certainty during the life of the animal. Having found it in

PLATE V.



Haines, del.

A Hoen & Co Lithocaustic, Baltimore

ŒSOPHAGOSTOMA COLUMBIANUM.
(Small Tumors of Cæcum.)

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some dead creatures our suspicions might be aroused, knowing that the whole flock had been treated about alike as far as external surroundings were concerned, so the exposure would be practically the same in all individuals. The worm causing this disorder may be found in the nodule by means of an ordinary, low-power, magnifying glass.

The worm may be discovered by allowing the greenish, cheesy contents of the nodule to escape into a watch glass containing some water, when, by careful teasing the apparent newer portion of these masses a little worm can usually be detected which is believed to be the cause of this disease. The disorder usually causes a species of indigestion which in its turn will materially interfere with the condition of the animal, causing it to become poorer. In a general way it may be inferred that sheep which become unthrifty, dyspeptic looking objects, exhibiting general debility and a marked tendency to diarrhœa on the slightest provocation are no doubt affected with this disease; therefore when sheep are found not to be doing well we have good reason for suspecting this disease. For further description of the complaint I will call the reader's attention to plates Nos. 4 and 5 with their descriptions.

TREATMENT.

This disease has not been investigated from a curative standpoint sufficiently to enable the writer to speak with anything like encouragement so far as individual medicines are concerned in overcoming it, although experience with like disorders suggests that treatment may profitably be applied, once we discover a specific for these organisms, but the remedy should, no doubt, be used in the early stage of the disorder before it has time to weaken the constitution of the animal to such an extent that it might be doubtful if it would regain its original tone even supposing the parasite was destroyed. It is probable, however, that some of the remedies used for intestinal parasites will answer very well for this if given in time.

PREVENTION.

As the disease is believed to be disseminated or spread from animal to animal by eggs dropping to the ground from affected sheep and taken from the pastures or dinking water by healthy animals, the cutting off of this means of circulation is a certain way of preventing this disorder, and sheep which are known to be healthy should be kept on new pastures by themselves and required to drink from troughs which have not been contaminated by diseased animals. If the sheep are fed from troughs instead of the ground the chances of dissemination of the complaint are reduced to a minimum.

LUNG WORMS IN SHEEP.

In one or two instance my attention has been called to flocks of sheep which exhibited certain peculiar symptoms, to wit.: The animals would possibly be lying quietly on the ground without suffering any unusual inconvenience, but if required to rise somewhat suddenly a paroxysm of coughing would be brought on and the creature would, in some instances, suffer great inconvenience thereby, even to the extent that it would be threatened with suffocation. The animals would be debilitated more or less according to the severity of the attack. The disease is usually found in young animals, is sometimes called verminous bronchitis, it being dependent upon worms in the bronchial tubes which irritate them under certain conditions to that extent that the cough previously alluded to, will be brought on. Not only this but the animals are often poorly nourished and may have a copious nasal discharge in which fragments of the worms can occasionally be discovered. The wool is easily pulled off, exhibiting a white, bloodless skin underneath, which peculiar appearance has given rise to the name "paper skin disease." The parasite which causes this disorder is technically called the *strongylus filaria.*

TREATMENT.

Of all the remedies which have been used by the writer preference is given to turpentine. It is known to those who study the actions of drugs that turpentine is eliminated from the system to some extent by the lungs. During its passage through these organs it has a very baneful effect upon the lower forms of animal life which may invade them, and no doubt causes their destruction. The medicine may be administered in the same doses and in the same manner as recommended for worms in other parts of this report. I have on some occasions resorted to the fumigation of the bronchial tubes with fumes of sulphur and while if judiciously applied it will have a good effect, great care must be taken that this line of treatment is not over-done as by so doing more harm than good is likely to result.

Another worm which invades the lungs of sheep is *strongylus ovis-pulmonalis.* It seems to invade the lung substance itself and gives rise to a disease which, to a casual observer, resembles tuberculosis very much indeed, there being nodules of variable size on the surface of the lung which in some instances contain pus. The nodules resemble very much the miliary appearance of tuberculosis. These two lung diseases often accompany one another and are overcome by the same kind of treatment, but it must be admitted that prevention is better than cure, and if the locality is free from the disorder the greatest care should be taken to keep the disease out, which can only be done by placing certain restrictions in the shape of quarantine upon new importations; and strange sheep, if permitted in the locality, should be kept by themselves for a month or two and if found affected with any disease of the verminous or worm-like nature the pasture upon which they have run during the quarantine season should not be used for healthy sheep for a season or so.

In preparing this report I have reviewed some of the literature of the various subjects, and selected many passages that seemed to be of practical importance and interest which I have taken the liberty of compiling along with my own experience of the different subjects treated upon.

In case I should not have given the authors of my quotations due credit at the proper time, I here beg to mention such admirable works as Buck's Hand Book of Medical Science, Sternberg's Bacteriology, various contributions from the Bureau of Animal Industry, Experiment Station Bulletins, Crookshank's Bacteriology, recent edition, to which I would refer the reader should he desire to follow these questions further.

In closing I desire to express much gratitude for the courtesy which has been extended to me on all occasions while in pursuit of my duties.

E. A. A. GRANGE,
State Veterinarian.

SEVENTH BIENNIAL REPORT

OF THE

LIVE STOCK SANITARY COMMISSION

FOR THE

YEARS 1897 AND 1898.

BY AUTHORITY

LANSING
ROBERT SMITH PRINTING CO., STATE PRINTERS AND BINDERS
1899

STATE LIVE STOCK SANITARY COMMISSION

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STATE VETERINARIAN

GEO. W. DUNPHY, V. S., - - - - Quincy, Michigan

REPORT

OF THE

STATE LIVE STOCK SANITARY COMMISSION

FOR THE BIENNIAL PERIOD OF 1897 AND 1898.

HON. HAZEN S. PINGREE, *Governor of Michigan:*

SIR—The State Live Stock Sanitary Commission have the honor to submit the following as their seventh biennial report, covering the years 1897 and 1898:

The result of fourteen years of the operation of one of the most effective live stock sanitary laws engrossed upon the statute books of any state or country, enables us to present to the world a sanitary condition of the domestic animals of this State unequaled by few states and surpassed by none. During the biennial period under review the general health of the domestic animals of the State may be said to have been good, as no special epizootic has occurred among any of our domestic aninals in any part of the State to cause a sweeping loss to any of our people.

There are less than half a dozen contagious or infectious diseases affecting the domestic animals of this State that this Commission does not feel itself competent to control. Standing at the head of these diseases that we are not masters of, in financial rank at least, should be placed hog cholera or swine plague. This disease, or these diseases, cause a greater annual money loss to our people than do all the other animal diseases falling under our purview. The scientist has not as yet exploited a successful hog cholera cure. The work of this Commission in the line of controlling the losses from these swine diseases lies along the line of confining an outbreak to the smallest possible area. The coming treatment indicated by the experiments of the Bureau of Animal Industry lies along the line of inoculation or what is known as the serum treatment. That consists of the inoculation of a herd, sick and well, with blood serum from an immune horse, made so by repeated inoculation with the active virus of hog cholera. The subject of swine plague and its control is more fully treated in another part of this report.

Another contagious disease of immense moment to the citizens of this State is tuberculosis of domestic animals, and more especially tuberculosis of the bovine race. This Commission is devoting a great deal of attention to the subject of controlling and eventually eradicating this disease, being the same disease as tuberculosis in man. The most effectual manner of controlling the spread of this disease, with a view to reducing its ravages to the minimum, is still somewhat of an unsolved problem. It is probable that if the disease is to be early and successfully combated, additional legislation will be desirable and the adjustment of property loss incident thereto in executing the law be specially or more specifically provided for. A more detailed discussion of this topic will be found in another part of this report.

The horse is probably either immune or non-susceptible to more of the contagious and infectious diseases of our domestic animals than is any other of our farm animals. In any event, substantially the only disease affecting horses that has caused or created work for this Commission has been glanders. We have ever regarded this loathsome disease as but mildly contagious, but absolutely in practice entirely incurable. We have simply waged a war of extermination against it. The results have been highly satisfactory. We do not regard it as extravagant when we express the opinion that there is not now one case of glanders in this State where there were one hundred when the work began. At present only occasional outbreaks occur, and in those cases we can usually trace the invasion to an animal imported from without the State. The practical extermination of this disease within our State is assured.

At the date of the organization of this Commission the loss of cattle in Michigan from Texas or splenic or southern fever was greater than from all other contagious or infectious diseases combined. At that date the annual cattle losses in the environments of Detroit alone exceeded $10,000, mostly the cows of poor people. Losses in other parts of the State frequently reached alarming proportions. The losses in the entire State of Michigan for the last five years from this cause have been nothing. Thousands of these disease-carrying cattle are annually slaughtered within our State. Tens of thousands of these are watered and fed in the State while in transit from their native pastures in the southwest to the consuming markets of the east. Our regulations for handling these disease-carrying cattle are so effective under the operation of our law as to bring about the above result.

During the last two years this Commission has noted some serious losses of cattle from Symptomatic Anthrax, or black-leg, and some losses from other cattle diseases. The disease known as Symptomatic Anthrax has appeared in this State, occasionally with very fatal results. This disease confines its work generally to young cattle and seldom affects a mature animal. It is not a contagious disease but an infectious disease. That is to say, one animal does not contract it by association with another animal affected with the disease. The affected animals become inoculated from the pasture, feed, or environments in which they are feeding. It is plainly apparent that the environments of the susceptible animals should be at once changed. Treatment of such animals is of little avail. The malady is acute. Its work is done rapidly, and its results, as a rule, are fatal. The young animals in an affected herd may be rendered to a certain extent immune from attacks of the malady, by vaccination. This vaccine virus is a commercial article and is also issued by the government under certain conditions. We extract the following from Circular No. 23, Bureau of Animal Industry, relating to this disease and the vaccine virus of same, as issued by the Department of Agriculture:

> **Blackleg, also known as "black quarter", "quarter ill" and "symptomatic anthrax", is an acute infectious disease caused by a specific germ, the blackleg bacillus. It is characterized by extensive alterations in the parts affected, accompanied by a distention of the tissues due to the formation of gas.**

SPECIES OF ANIMAL AFFECTED.

Cattle contract the disease on pastures, and this is also stated to be the case with sheep and goats. All three species of animals can be artificially inoculated with blackleg, though cattle and sheep are more readily inoculated than goats. Guinea pigs are very susceptible. When horses, asses and white rats are inoculated, the only result noticed is a local swelling, which in time disappears. Some animals, such as swine, dogs, cats, rabbits and black rats, enjoy a natural immunity from this disease, and attempts to inoculate them are therefore unsuccessful. Man also is unaffected by the blackleg bacillus.

AGES OF CATTLE AFFECTED.

Blackleg is more common in cattle from 1 to 2 years old than in cattle of any other age; occasionally animals from 6 months to 1 year old or from 2 years to 2½ years old may be attacked, and in rare cases calves under 6 months or cattle over 2½ years may be affected. The comparative freedom of calves from the disease is to be explained in two ways: First, calves are naturally less susceptible to blackleg than are older animals, as has been shown by experimental inoculation; second, animals feeding on milk are less exposed to infection than are grazing animals.

MANNER OF INFECTION.

Blackleg is not a contagious disease; that is, one animal will not contract it by simply coming in contact with another. As a rule the germ is introduced into the system through some wound or abrasion of the skin or mucous membranes, such as may be received on the skin from a barbed wire fence or from stubbles or briars in the pasture, or from any hard, sharp substance which punctures the lining of the mouth or intestinal tract.

CHARACTERISTICS OF THE BACILLI.

The blackleg bacilli are not able to multiply in the presence of oxygen; in technical language, they are anaerobic. This explains the fact that while they do not develop on parts of the body exposed to free air, such as the skin and mucous membranes, the germs find the conditions necessary to their growth in the parts underneath the skin, as the underlying connective tissue, to which the air does not have access. The second point to be noticed in connection with the bacilli is that one of the ends of each bacillus is enlarged. This enlargement is due to the formation of a so called "spore," which is a small portion of the germ surrounded by a hard, shell-like substance; a structure of this kind is naturally very resistant to external influences, being able to withstand heat, cold, light and other unfavorable conditions, and even decomposition in a dead body, which would more quickly result in the destruction of unprotected bacilli. With such a spore stage to protect it, the blackleg germ may exist for a long time outside of the body, and it is very difficult to eradicate the disease from a pasture which has once become infected. Experience shows that the spores may exist almost indefinitely in the ground, and that animals may become infected on the same pasture year after year. It is claimed that cultivating the soil for several years will effectually eradicate the disease, but with large areas which are unfit for anything except pasturage this method is of course impracticable.

SYMPTOMS.

The symptoms of blackleg are so characteristic that the disease is easily recognized. The first symptoms may be either of a general or of a local nature, though more frequently the latter is the case The general symptoms are high fever, loss of appetite, and suspension of rumination, followed by great depression. Respiration becomes accelerated; the animal moves around with difficulty, frequently lies down, and, when water is near at hand, drinks at short intervals and but little at a time. The visible mucous membranes are at first dark red and congested, but they change in the course of twelve hours to a dirty leaden or purplish color.

The most important diagnostic feature is the development of a tumor or swelling under the skin. This swelling may appear on any part of the body and limbs, except below the knee or hock-joint. It is frequently seen on the thigh or shoulder, and, owing to the extensive discoloration of the swollen parts, as observed after the animal has been skinned, the disease has been popularly named "blackleg" or "black quarter." Tumors may also appear on the neck, the chest, the flank or the rump. At first they are small and very painful. They increase rapidly in size and may in a few hours cover a large portion of the body. One or more of these tumors may form simultaneously, and when in close proximity to each other may become confluent. The neighboring lymph glands become considerably swollen.

If slight pressure is exerted on the tumor a crackling sound is heard, and percussion gives a clear, resonant tone, due to the collection of gas in the affected tissue. The tumor is cool to the touch and painless in the center; the skin over it is dry and parchment-like. When the tumor is lanced a frothy, dark-red fluid is discharged. If the incision is made while the animal is alive or immediately after death, there is no offensive odor to the discharge, but decomposition takes place very soon after death. No pain is manifested when the center of the tumor is lanced, but as soon as the knife reaches the warm, inflamed part the animal will bellow loudly and flinch.

The swellings usually appear before the general symptoms, and they may even reach such an extent as to cause complete paralysis of the affected part while the animal still looks bright and has a good appetite. This condition is, however, of short duration. As the swellings increase in size the general symptoms become more intense. The temperature may reach 107° F., while the respiration may exceed 140 per minute. The animal is unable to rise; the extremities become cold, and some time before death the temperature falls and may become subnormal. There is trembling of the muscles, which, as death approaches, may develop into violent convulsions.

APPEARANCE AFTER DEATH.

The skin over the swelling is affected with dry gangrene. The connective tissue beneath the skin is infiltrated with blood and bloody serum, and is distended with gas. The affected muscles are dark brown or black, are easily torn, and the spaces surrounding them are filled with bloody liquid and gas. The color is deepest at the center, shading off toward the edges, and becomes brighter by contact with the air. On compression thick blood escapes, which is charged with gas and has a disagreeable odor. The gas of the tumor is combustible and burns with a blue flame, being, according to Bollinger, carbureted hydrogen. The abdominal cavity sometimes contains a considerable quantity of bloody effusion. The mucous membrane of the intestine may be congested or inflamed and the contents of the bowels may be covered with blood. The liver is congested, but the spleen is always normal. The flesh decomposes rapidly, and the carcass is soon greatly swollen by the accumulation of gas under the skin and in the body cavities.

It is sometimes desirable to determine whether an animal is affected with black quarter or with anthrax tumor, or with a swelling caused by the bacillus of malignant œdema. The anthrax tumor may be distinguished by the hardness and solidity of the tumor, and by the fact that it contains no gas. The spleen is enlarged in anthrax, and is unaffected in black quarter. It is difficult to distinguish between the swellings of black quarter and malignant œdema, since they resemble each other very closely, and both are distended with gas. Malignant œdema, however, generally starts from a wound of considerable size; it often follows surgical operations, and does not usually result from the small abrasions and pricks to which animals are subjected in pastures.

TREATMENT.

Owing to the rapid and violent course of the disease, treatment is of little or no value. Numerous remedies have been proposed and tried, but the cases of recovery on record are exceedingly rare. It has been suggested to make a number of deep incisions into the affected part and to apply some strong disinfectant to the wounds, but even such radical measures have proved to be of very little value, and only tend to cause the animal unnecessary suffering. Furthermore, when this treatment is undertaken in a pasture, the animal is liable to scatter the discharge from the wounds over large areas, and thus spread the infection. It is, therefore, strongly recommended never to attempt this treatment except when the animal is confined in a place which can be thoroughly disinfected.

DISPOSITION OF BLACKLEG CARCASSES.

All animals which die from blackleg should be immediately burned before they are attacked by vermin or birds of prey, as these may scatter the infection. In order thoroughly to destroy a carcass, it should be placed upon two logs and a cord of dry wood heaped over and around it. If one fire does not destroy it completely, another should be built over the parts remaining. In a pasture where wood is scarce, the carcass may be buried; in this case the hole in the ground should be at least 6 feet deep and the carcass should be well covered with lime before the earth is filled in. Lime should also be scattered freely over the grave and also over the space where the animal was lying before being buried. No effort should be spared to make sure that infection from the dead animal is impossible. It is due to neglect of these important precautions that blackleg has gained such a foothold in certain parts of this country as almost to make cattle raising unprofitable.

PREVENTIVE VACCINATION.

For several years frequent reports have come to this Bureau concerning the great mortality from blackleg among young stock in many widely separated districts of the United States. In some of the southern and western States especially, the annual losses from this fatal disease have been so great as easily to exceed the losses of cattle from all other causes combined. These losses have been particularly felt by the progressive stock growers, as by far the largest percentage of the calves which became affected were either full-blood or highly graded animals, which appear to be more susceptible to blackleg than the ordinary common bred stock. As the continued existence of blackleg has a very detrimental effect upon the cattle industry in general, and especially upon those stock owners who, through untiring efforts and great expense, have endeavored to improve their herds, an investigation has been made by this Bureau with a view to devising some measure through which the steadily increasing losses might be arrested or reduced as much as possible.

A "single vaccine" has been prepared in the pathological laboratory of the Bureau, and subsequently tested on a large number of calves in Texas, both common and high grade stock, and the results warrant the conclusion that this vaccine is in every way satisfactory. It is desired, however, before distributing the vaccine to stock owners in general, to obtain records of several thousand successful vaccinations. For this purpose a quantity of vaccine will be distributed to such parties as may desire to make preliminary vaccinations and report the results to this Bureau. Explicit instructions will be sent with the vaccine to secure uniformity of operation and to assist persons who are without previous experience in the vaccinations.

ANIMALS TO BE VACCINATED.

Calves, as a rule, should not be vaccinated until they are half a year old. Under this age they are practically immune against blackleg, and it has been claimed that when vaccinated before they are half a year old they are liable to lose the artificial immunity induced by means of vaccination and become susceptible again. Animals more than 2½ years old, as stated above, are seldom affected, and the mortality among them is so small that it makes vaccination unprofitable. It is the calves between one-half and 2½ years old which should be vaccinated.

Vaccination has no ill effect on calves half a year old, but it should be a rule that when very young animals are vaccinated they should be revaccinated the following year.

Two serious and destructive diseases of sheep have been very successfully handled by this commission, viz.: foot rot and scab. Foot rot is occasionally imported to this State, but a case of it is now so seldom seen that it is somewhat of a curiosity. It is practically fatal to a flock of fine wool or Merino sheep on account of the long and spongy character of their feet, should a pasture in which they run become infected with the germs of this disease. Should an outbreak of foot rot occur in a flock of sheep it should receive prompt and heroic treatment.

Scab or scabbies of sheep is a highly contagious disease. It is annually imported to our State with the feeding sheep and lambs brought to our feed lots and pens. The stock yards and pens at Buffalo, Chicago and farther west, as well as thousands of the stock cars of the country, are infected with the scab mite. Sheep and lambs bought at or passing through these yards are in all cases exposed, and in most cases will develop the disease, if no preventive measures are taken. The remedy lies in thoroughly dipping, at least twice, with ten or twelve days intervening between the dippings. The treatment will be all the more effective if the sheep or lambs are shorn before dipping. In shorn condition a couple of successive dippings is usually effective, particularly so if the stock can be placed in new, clean, uninfected environments. Otherwise, in many cases, the dipped animals become re-infected from the yards, pens and barns, in which they are kept. Formerly scabby sheep were not uncommon on many farms in this State, and in case of wrinkly Merinos, it was practically impossible to treat it successfully and save the flock. In late years all our outbreaks of scab among farm sheep may be traced to careless handling of infected sheep brought into the State as before alluded to. Bulletin No. 21, U. S. Department of Agriculture, Bureau of Animal Industry, is devoted to sheep scab, its nature and treatment. We quote liberally from same as follows:

SHEEP SCAB: ITS NATURE AND TREATMENT.

HISTORICAL INTRODUCTION.

The disease commonly called sheep scab is the mange, or scabies, of the sheep. It is a contagious skin disease caused by a parasitic mite. This disease is one of the oldest known, most prevalent, and most injurious maladies which affect this species of animals.

LOSSES CAUSED BY SCAB.

Losses in Home Industry.—The losses from sheep scab have been and are still very severe in most sheep-raising countries. They are due to the shedding of the wool, the loss of condition and the death of the sheep.

In the United States some sections have been overrun with sheep scab, and many persons engaged in the sheep industry have been forced to forsake it because of their losses from this disease. It is probable that in its destruction of invested capital sheep scab is second only to hog cholera among our animal diseases. The large flocks of the Plains and Rocky Mountain region and the feeding stations farther east have suffered severely and are constantly sending diseased animals to the great stock yards of this country. As a consequence of this marketing of affected sheep, the stock yards are continually infected, and any sheep purchased in these markets are, unless properly dipped, likely to develop the disease after they are taken to the country for feeding or breeding. There is in this way a constant distribution of the contagion, and thousands of persons who know little of its nature or the proper methods of curing it find that they have introduced it upon their premises.

CAUSE OF SCAB.

Sheep scab is a strictly contagious disease.

Common Sort.—Common sheep scab is caused by that species of mites technically known as *Psoroptes communis*. Parasites of this species cause scab in horses, cattle, sheep, goats and rabbits; but for each of these species of animals there appears to be a distinct variety of this parasite. Although it is more or less difficult to distinguish between these varieties, they differ somewhat in size, and it is found that the *Psoroptes communis* of the sheep does not cause scab of the horse, ox or rabbit; nor, on the other hand, does the *Psoroptes communis* of the horse, ox or rabbit cause scab of the sheep. Naturalists, therefore, distinguish the parasite of sheep scab by the name *Psoroptes communis* var. *ovis*.

The parasite of this disease is one of the larger mites, and is quite easily seen with the naked eye.

The psoropt inhabits the regions on the surface of the body which are most thickly covered with wool; that is, the back, the sides, the rump and the shoulders. It is the most serious in its effects upon sheep of any of the parasitic mites, and it is the cause of the true body scab.

DESCRIPTION OF SHEEP SCAB.

COMMON SCAB, BODY SCAB OR PSOROPTIC SCAB.

Although the symptoms of common scab are familiar to most farmers, they will here be briefly reviewed.

The mites of common, or body, scab—that is, the Psoroptes—prick the skin of the animal to obtain their food, and probably insert a poisonous saliva in the wound. Their bites are followed by intense itching, with irritation, formation of papules, inflammation, exudation of serum, and the formation of crusts, or scabs, under and near the edge of which the parasites live. As the parasites multiply they seek the more healthy parts, spreading from the edges of the scab already formed, thus extending the disease. The sheep are restless; they scratch and bite themselves, and rub against posts, fences, stones, or against other members of the flock. This irritation is particularly noticeable after the animals have been driven, for the itching is more intense when the sheep become heated. The changes in the skin naturally result in a falling of the wool; at first slender "tags" are noticed; the fleece assumes the condition known as "flowering;" it looks tufty or matted, and the sheep pulls out portions with its mouth, or leaves tags on the objects against which it rubs. Scabs fall and are replaced by thicker and more adherent crusts. The skin finally becomes more or less bare, parchment-like, greatly thickened, furrowed and bleeding in the cracks. With shorn sheep especially, a thick, dry, parchment-like crust covers the greatly tumified skin. Ewes may abort or bear weak lambs.

Parts of Body Affected.—When sheep are kept in large numbers the chances for infection are naturally greater, and the disease may begin on almost any part of the body. Generally, however, it affects the parts which are covered with wool. When the sheep are fat and the wool has a large amount of yolk, the progress of the disease may be slow; usually beginning on the upper part of the body, withers and back, it extends slowly, but none the less surely and in ever-increasing areas, to the neck, sides, flanks, rump, etc. In two or three months the entire body may be affected.

Contagion.—Common scab is exceedingly contagious from one sheep to another, and may in some cases show itself within about a week after healthy sheep have been exposed to infection. The contagion may be direct, by contact of one sheep with another; or indirect, from tags of wool, or from fences, posts, etc., against which scabby sheep have rubbed, or from the places where the sheep have been "bedded down." One attack of scab does not protect sheep from later attacks.

Chances for Recovery.—Cases of apparent spontaneous recovery are rare. Usually when proper methods of treatment are not adopted the disease increases, leads to anæmia, emaciation, exhaustion and death, and may result in a loss of from 10 to 80 per cent of the flock. Scab is favored by seasons when the wool is longest, and by huddling or overcrowding the animals; also race, energy, temperament, age, state of health, length, fineness and abundance of wool, and the hygienic conditions of the surroundings influence the course and termination of the disease. Young, weak, closely inbred animals, and those with long, coarse wool will most quickly succumb. Unhealthy localities, damp climate and poorly ventilated sheds favor the disease. Pure or mixed Merino sheep succumb sooner than certain other breeds. The mortality varies according to conditions, but is highest in autumn and winter. When owners are careless the death rate may be very high; if untreated the sheep may die in two or three months. Hygienic conditions, good food and cool dry atmosphere tend to check the disease. Sheep sheds should accordingly be well ventilated and open to light and sunshine. With proper attention to hygienic conditions and thorough dipping, a positive cure can be guaranteed.

Vitality of the Parasite.—Taken from the sheep, the mites possess a remarkable vitality. It is generally stated that, kept at a moderate temperature on portions of scab, the adults may live from four to twenty days, but they will occasionally live much longer; cases are on record where they have lived three, four, or even six weeks when separated from sheep; if the atmosphere is dry they will generally die in about fifteen days; but death is often only apparent, for the mites may sometimes be revived by warmth and moisture even after six or eight weeks; the fecundated females are especially tenacious of life. Various rather contradictory statements may be found regarding their resistance to cold. Krogman states that they may live at a temperature of minus 10° C. (+14° F.) for twenty-eight days. Other authors claim that the mites die in two hours at 47° F.; still other authors, that they die at 50° C. (122° F.) They are said to have been kept alive in cold water for six days and in warm water for. ten days. Several authors admit, however, that the parasites are usually killed by a soaking rain; though it is claimed that in damp, dark stables they "may live for months."

Experience has shown that in some cases apparently healthy sheep have become infected in places where no sheep have been kept for four, eight, twelve or even twenty-four months. The conditions underlying this infection are not thoroughly understood. Possibly some of the eggs have retained their vitality a long time and then hatched out; possibly the vitality of the fecundated female has also played a role; while it is not at all improbable that an entirely new infection has accidentally been introduced by birds or other animals. Certain authors of high standing scout the idea that birds can introduce an infection of scab, but there is no reason why birds should not do this, and there are some reasons for believing that they do. It has been noticed on the Experiment Station of the Bureau, for instance, that crows delight in perching on the backs of scabby sheep and picking at the scab. While so doing it is only natural that small tags of wool would adhere to their feet, and thus scatter scab. The fact that snails cling to birds' feet and are carried long distances is too well established to need discussion, and it is very probable that many of the cases where sheep are supposed to have become infected with scab on pastures which have not been occupied for one or two years are in reality cases of fresh infection by means of birds. From the data at hand, while it may be admitted that in some cases, under favorable conditions, the mites may live from spring to fall, it is scarcely within the limits of probability that either the scab mites or their eggs will live through a winter when separated from the sheep and exposed to the elements.

All matters connected with the vitality of the scab mite have an important bearing in explaining cases of indirect infection on roads over which scabby sheep have been driven, or in fields and sheds where they have been kept. From the facts now at our disposal we can lay down the following important rules:

(1) Scabby sheep should never be driven upon a public road; (2) sheds in which scabby sheep have been kept should be thoroughly cleaned, disinfected and aired, and should be left unused for *at least four weeks* (better two months) before clean sheep are placed in them; (3) fields in which scabby sheep have been kept should stand vacant *at least four weeks* (better six or eight) before being used for clean sheep; (4) a drenching rain will frequently serve to disinfect a pasture, but it is well to whitewash the posts against which scabby sheep have rubbed. Even after observing the precautions here given it is not possible to absolutely guarantee that there will be no reinfection, but the probabilities are against it.

Life History of the Parasite.—A study of the life history of the scab parasite is necessary in order to determine several important points of practical value, such as the proper time for the second dipping, etc.

The female mite lays about 15 to 24 eggs on the skin, or fastened to the wool near the skin; a six-legged larva is hatched; these larvæ cast their skin and become mature; the mites pair and the females lay their eggs, after which they die. The exact number of days required for each stage varies somewhat, according to the writings of different authors, a fact which is probably to be explained by individual variation, and by the conditions under which the observations and experiments were made. Thus Gerlach, in his well-known work (1857), estimates about fourteen to fifteen days as the period required for a generation of mites from the time of pairing to the maturity of the next generation. He divides this time as follows: Under ordinary conditions the eggs hatch in three to four days, although two authors allow ten to eleven days for the egg stage; three or four days after birth the six-legged larvæ moult and the fourth pair of legs appears; this fourth pair is always present when the mites are two-thirds the size of the the adult; when seven to eight days old the mites are mature and ready to pair; several (three or four) days are allowed for pairing; another generation of eggs may be laid fourteen to fifteen days after the laying of the first generation of eggs. Without going into all of the other observations on these points, it may be remarked that the eggs may not hatch for six or seven days; the six-legged larvae may moult when three to four days old, and become mature; after pairing a second moult takes place, lasting four to five days; a third moult follows immediately, then eggs are laid and the adults die; in some cases there is a fourth moult, but apparently without any further production of eggs. Accepting Gerlach's estimate of fifteen days as an average for each generation of ten females and five males, in three months' time the sixth generation would appear and consist of about 1,000,000 females and 500,000 males.

Several practical lessons are to be drawn from these figures: First, it is seen that the parasites increase very rapidly, so that if scab is discovered in a flock, the diseased sheep should immediately be isolated; second, if new sheep are placed in a flock, they should either first be dipped, as a precautionary measure, or they should at least be kept separate for several weeks to see whether scab develops; third, since the chances for infection are very great, the entire flock should be treated, even in case scab is found only in one or two animals; fourth, as dipping is not certain to kill the eggs, the sheep should be dipped a second time, the time being selected between the moment of the hatching of eggs and the moment the next generation of eggs is laid. As eggs may hatch between three and seven (possibly ten or eleven) days, and as fourteen to fifteen days are required for the entire cycle, the second dipping should take place after the seventh day, but before the fourteenth day; allowing for individual variation and variation of conditions, the tenth, eleventh or twelfth day will be the best time to repeat the dipping.

HEAD SCAB, BLACK MUZZLE, OR SARCOPTIC SCAB.

Head scab is less frequent and less important than body scab. No case of it has ever been reported by the inspectors of this Bureau, and many extensive sheep breeders and professional sheep dippers state that they have never heard of a case.

FOOT SCAB, OR CHORIOPTIC SCAB.

Foot scab is rare, if present at all, in this country, but a number of cases have recently been reported from England. It is not impossible that some of the cases supposed to be foot rot are in reality foot scab.

The minute parasites, which are much smaller than those of common scab, cause an intense itching, which leads the sheep to stamp their feet and scratch and bite the infected parts. There is a reddening of the skin, followed by scaling, and later by the formation of yellowish white crusts; the crusts thicken, cracks may form in the folds of the pasterns, and the legs may become quite unsightly.

Parts of the Body Affected.—The disease appears on the feet and legs, spreading slowly to the upper parts of the legs and the adjoining parts of the body, scrotum or udder.

Contagion.—This disease is contagious from sheep to sheep, but not so actively as common scab

FOLLICULAR SCAB, OR DEMODECTIC SCAB.

The glands of the sheep's eyelids are occasionally infected with a fourth kind of microscopic mite, which is elongate and much like a worm. It has been recorded but a few times, and for the present, at least, is of no importance to the American sheep raiser.

CONDITIONS WHICH MAY BE MISTAKEN FOR SCAB.

Any parasite or condition which causes an itching, and thus leads the sheep to scratch themselves, or any abnormal condition of the skin, may be temporarily mistaken for scab; but if the rule is held in mind that no scab is possible without the presence of the specific parasites, it will be easily determined whether scab is present or not. The following are the more important cases to be considered:

(1) *Itching Due to Other Parasites*, Such as the common "sheep tick," true ticks and lice, may be distinguished from scab by finding the parasites. The dipping used for treating scab will also kill sheep ticks and lice.

(2) *Inflammation of the Sebaceous Glands.*—This may be mistaken for common scab. It appears most frequently in autumn. There is a severe itching, the skin is red and sensitive, and is covered with a strong-smelling, yellowish, viscid yolk; tufts of wool may be shed. It may be cured, after shearing, with any starchy lotion.

(3) *Rain Rot.*—In rainy weather an eruption may appear on the skin which might be mistaken for scab. There is, however, no parasite present; itching is absent, and the trouble disappears when dry weather comes.

THE TREATMENT OF SCAB.

In the foregoing discussion attention has been called to the necessity of keeping sheep under proper hygienic conditions. That alone, though of importance in connection with the subject of treatment, can not be relied upon to cure scab. The only rational treatment consists in using some external application which will kill the parasites. Formerly medicines were given internally, and even within a few years past it has been claimed that feeding sulphur to sheep will cure the disease. The statements regarding sulphur were such as to lead us to try the experiment, which, however, was soon abandoned as unsuccessful. The external application of scab cures is in various ways made known as hand dressing, hand curing, spotting, pouring, smearing and dipping. Of these methods, dipping is by far the most satisfactory.

DIPPING.

By far the most rational and satisfactory, and the cheapest method of curing scab is by dipping the sheep in some liquid which will kill the parasites. The dipping process is as follows:

(1) Select a dip containing sulphur. If a prepared "dip" is used which does not contain sulphur, it is always safer to add about 16⅔ pounds of sifted flowers of sulphur to every one hundred gallons of water, especially if, after dipping, the sheep have to be returned to the old pastures.

(2) Shear all the sheep at one time, and immediately after shearing confine them to one-half the farm for two to four weeks. Many persons prefer to dip immediately after shearing.

(3) At the end of this time dip every sheep (and every goat also, if there are any on the farm).

(4) Ten days later dip the entire flock a second time.

(5) After the second dipping, place the flock on the portion of the farm from which they have been excluded during the previous four or five weeks.

(6) Use the dip at a temperature of 100° to 110° F.

(7) Keep each sheep in the dip for two minutes by the watch—do not guess at the time—and duck its head at least once.

(8) Be careful in dipping rams, as they are more likely to be overcome in the dip than are the ewes.

(9) Injury may, however, result, to pregnant ewes, which must, on this account, be carefully handled. Some farmers arrange a stage, with sides, to hold the pregnant ewes, which is lowered carefully into the vat, and raised after the proper time.

(10) In case a patent or proprietary dip, especially an arsenical dip, is used, the directions given on the package should be carried out to the letter.

CHOICE OF A PREPARATION FOR DIPPING.

Numerous different sheep dips are recommended by various parties, and undoubtedly many of them are efficacious; few dips can be named which some persons do not consider far superior, and other persons consider far inferior to all other dips known; few dips can be found which have not cured cases of scab, and probably no dip can be named with which failures have not been reported. Under these circumstances, the farmer should not be deceived by exaggerated statements in either extreme. He should recall that it lies in the business interest or the manufacturers of every proprietary or patent dip to advertise their own particular dip in every way possible, but that too often these merchants pursue the method of deprecating the use of homemade dips as "dangerous," "ineffective," "liable to produce blood poisoning," etc., and of citing the accidents, failures and dangers of other proprietary dips rather than giving exact and reliable statements regarding the successes of their own compounds.

PROPRIETARY ARTICLES.

The Department can not properly advertise or recommend the use of any dip which is made from a secret formula. It cannot be said that no such dip has any value as a scab cure, or that such dips have never met with any success, for that would be a misrepresentation of facts. The farmer should, however, know the composition of the material he is using. If he desires to use a ready-made dip, let him inform himself of the exact nature of that dip in order to prevent impositions and guard against dangers. He would do well to refuse to purchase any prepared dip which does not bear on each package a printed statement of the ingredients and their proportions, which the manufacturer guarantees are to be found in that package; he would also do well to avoid any dip which irresponsible parties advertise as "the only sure cure for scab," etc. Proprietors thus advertising are either showing gross ignorance of the history and nature of scab, and hence are not to be taken as advisers, or they are intentionally misrepresenting established facts.

In case of more than one proprietary dip, it seems quite clear from the circulars and advertisements distributed by the manufacturers that the firms have had little or no practical experience with scab, and that the extravagant claims set forth by them for their mixtures are little less than artful methods of advertising, rather than statements based upon any tests or experiments. Good examples of worthless or almost worthless dips are cited by Bruce, who quotes the treatment of 80,021 cases of scab with *Allen's Specific*, with not a single case of cure! *Hayes's Specific* cured 6,255 cases and failed in 80,931 cases!

SUCCESS WITH HOMEMADE DIPS.

While a dip should not be condemned simply because it is prepared ready for use—for it may be frankly admitted that there are some excellent proprietary dips—the value of the homemade dips must be insisted upon, and attention is called to the fact that it was almost entirely through homemade dips that scab was eradicated from certain of the Australian colonies, and that year after year, in the reports of the scab inspectors of Capetown Colony, the first and third places are accorded to homemade dips, while second place is accorded (with some qualifications) to a secret dip. In this connection the following significant remarks, made in 1892 by the chief inspector of stock in Queensland, will be of interest:

"Our Australian experience of tobacco and sulphur and lime and sulphur as the only effectual means of curing scab is such that at the stock conference held in Sydney in 1886, and again in Melbourne in 1889, attended by the chief and Government veterinarians of all the colonies, it was on both occasions decided that none but these two dips be recognized in the colonies, and this has now been embodied in regulations under the 'Stock disease acts' of the colonies.

"The stamping out of scab in these colonies has been more retarded by venders of patent dips than by any other cause; hence the determination of the governments of all the colonies to forbid the use of any specific except tobacco and sulphur or lime and sulphur for scab or for the (precautionary) dressing of imported sheep while in quarantine."

In view of the more or less frequent statements that scab was eradicated from the English colonies by killing the scabby sheep or by the use of prepared dips it may be well to say that these statements are erroneous. "It is true an act was passed in New South Wales about 1851 compelling the slaughter of scabbed sheep, and a few remaining straggling flocks were destroyed under that act, but later, on the reappearance of scab in that colony in 1863 by infection from Victoria, the act was repealed, and the whole of the scabbed sheep, about 400,000, was completely cured by means of tobacco and sulphur."

IMPORTANCE OF PROPER USE OF DIP.

Whatever dip is selected, the farmer should not forget that there are two ways to use that dip. One way is to prepare and use it in accordance with the directions given; the other way is to attempt to economize time, labor, or money by using the dip in weaker proportion than advised, by hurrying the sheep through the swim, or by later placing the dipped sheep under unfavorable conditions. If the former method is adopted with any of the established dips, the treatment ought to be followed with favorable results; but if the latter method is adopted, the farmer himself must assume the responsibility of failure, no matter which dip he decides to use. Every farmer should therefore remember that when he has decided upon the dip he is to use his work is only begun; to use the dip properly is fully as important as to use a dip at all.

PRELIMINARY QUESTIONS IN CHOOSING A DIP.

The homemade dips which are most commonly used have either tobacco or sulphur as their basis, while the prepared dips contain tobacco, sulphur, arsenic, carbolic acid, etc., as curative agents.

In selecting a dip several points should be considered: First of all, the question of expense will naturally arise; next, the question as to whether or not scab actually exists in the flock to be dipped, or whether or not the dipping is more of a precautionary matter, or for the sake of cleansing the animal's skin. The facilities at hand, the setback to the sheep and the length of the wool are also matters for consideration, as well as the pastures into which the dipped sheep are to be placed. Notwithstanding statements to the effect that a given dip can be used under all conditions, the above questions are evidently important.

Expense.—In estimating the expense one should consider not only the actual outlay for the ingredients of the ooze, but the cost of fuel and labor, the injury, if any, to the sheep and the liability of not curing the disease. It is much more economical to use an expensive dip and cure scab than it is to use a cheap dip and fail to cure it. To illustrate with a well-known homemade dip: A lime-and-sulphur dip may be made in ten to thirty minutes, with but little fuel and little labor, which may or may not cure the disease, and which will surely do great injury to the wool; or a lime-and-sulphur dip may be made in several hours' time, at the expense of considerable fuel, labor and patience, which can be relied upon to cure scab, and which will do little or no injury to the wool. The first dip is cheap, but not economical; the second dip is more expensive, but more economical.

Does Scab Exist in the Flock?—Every farmer should ask himself this question before he selects his dip. If scab does not actually exist and the wool is long, the dipping in this case simply being a matter of precaution, it is best not to select a dip containing lime. The use of the lime-and-sulphur dips is therefore not advised simply as precautionary dressing for healthy long-wooled sheep. On the contrary, the use of any dip containing lime, as a precautionary measure, should be avoided.

The Facilities at Hand for Preparing Dip.—If fuel is very scarce, so that it is impractical to boil the mixture for at least two hours, the lime-and-sulphur dips should not be selected. A tobacco-and-sulphur dip, as well as many of the better proprietary dips, can be made without the necessity of lengthy boiling, and should be given preference whenever facilities for boiling are not at hand.

The Length of the Wool.—See remarks upon this subject in discussion of lime and sulphur, page 18.

The Pastures.—In case it is necessary to place the dipped sheep on the same pastures they occupied before being dipped, it is always best to use a dip containing sulphur. If a proprietary dip is selected under those circumstances, it is suggested that sulphur be added, about 1 pound of flowers of sulphur to every 6 gallons of dip. In case it is possible to utilize fresh pastures after dipping, the use of sulphur is not so necessary, but is always advisable. The object in using sulphur is to place in the wool a material which will not evaporate quickly, but will remain there for a longer period of time than scab parasites ordinarily remain alive away from their hosts. By doing this the sheep are protected against reinfection.

KINDS OF DIP.

Sulphur is one of the oldest known remedies for scab, its use dating back to Columella in the early part of the Christian era. As a scab eradicator, it must be placed among the best substances at our disposal. It is one of the constituents of certain proprietary dips, but its use to the farmer is best known in the tobacco-and-sulphur dip and in the lime-and-sulphur dip. These homemade mixtures are the two dips which have played the most important rôles in the eradication of scab from certain English colonies, and their use, especially the use *as well as the abuse* of lime and sulphur, is quite extensive in this country.

THE TOBACCO AND SULPHUR DIP.

The formula, as given here and as adopted by the New South Wales sanitary authorities, appears to have first been proposed in 1854 by Mr. John Rutherford. Regarding its success in Australia, Dr. Bruce, chief inspector of sheep for New South Wales, makes the following statements:

> "On the Hopkins Hill Station Mr. Rutherford, with two dressings of these ingredients, then cured over 52,000 sheep which had been infected for eighteen months; and he also subsequently cured with two dippings the sheep on Mount Fyans Station, where they were in most wretched state, and had been scabby for more than three years, and that, too, in both cases, without destroying a single hurdle or yard or removing any of the sheep from their old runs.
>
> "Since then millions of scabby sheep have been permanently cured in Victoria in the same way, and in South Australia and New South Wales hundreds of thousands of scabby sheep have also been cleansed with tobacco and sulphur. In fact, this dressing has the credit of having eradicated scab from the flocks of both the latter colonies, and there are good grounds for asserting that had this remedy not been known and used neither colony would be, as they both are now, almost entirely free from the scourge. Judging therefore from the experience of the three colonies, there is no medicament or specific yet known [1884] that can be compared with tobacco and sulphur as a thorough and lasting cure for scab in sheep."

The proportions adopted by Rutherford, and afterwards made official by the scab sanitary authorities, are:

Tobacco leaves	pound	1
Flowers os sulphur	"	1
Water	gallons	6

The advantage of this dip lies in the fact that two of the best scab remedies, namely, tobacco (nicotine) and sulphur, are used together, both of which kill the parasites, while the sulphur remains in the wool and protects for sometime against reinfection. As no caustic is used to soften the scab, heat must be relied on to penetrate the crusts.

Directions for Preparing the Dip.—A. Infusing the tobacco: Place 1 pound of good leaf or manufactured tobacco for every 6 gallons of dip desired in a covered boiler of cold or lukewarm water and allow to stand for about twenty-four hours; on the evening before dipping bring the water to near the boiling point (212° F.) for an instant, then remove the fire and allow the infusion to stand over night.

B. Thoroughly mix the sulphur (1 pound to every 6 gallons of dip desired) with the hand in a bucket of water to the consistency of gruel.

C. When ready to dip, thoroughly strain the tobacco infusion (A) from the leaves by pressure, mix the liquid with the sulphur gruel (B), add enough water to make the required amount of dip and thoroughly stir the entire mixture.

All things considered, the tobacco-and-sulphur is as good a dip as is known at the present time.

See also the discussion of the tobacco dips on page 21.

LIME-AND-SULPHUR DIPS.

Under the term "lime-and-sulphur dips" is included a large number of different formulæ requiring lime and sulphur in different proportions. In general practice all of these dips are spoken of as "the lime-and-sulphur dip," but in reality each separate formula represents a separate dip.

To give an idea of the variety of the lime-and-sulphur dips, the following list is quoted, the ingredients being reduced in all cases to avoirdupois pounds and United States gallons:

1. The original "Victorian lime-and-sulphur dip" proposed by Dr. Rowe, adopted as official in Australia:

Flowers of sulphur	pounds	20⅚
Fresh slaked lime	do	$10\frac{5}{12}$
Water	gallons	100

2. South African (Cape Town) official lime-and-sulphur dip:

Flowers of sulphur (minimum)	pounds	15
Unslaked lime	do	15
Water	gallons	100

3. South African (Cape Town) official lime-and-sulphur dip, February 4, 1897:

Flowers of sulphur	pounds	20⅚
Unslaked lime	do	16⅔
Water	gallons	100

4. Nevada lime-and-sulphur dip:

Flowers of sulphur	pounds	16⅔
Lime	do	33⅓
Water	gallons	100

5. Fort Collins lime-and-sulphur dip:

Flowers of sulphur	pounds	33
Unslaked lime	do	11
Water	gallons	100

6. A mixture which, used to some extent by this Bureau, contains the same proportions of lime and sulphur (namely, 1 to 3) as the Fort Collins dip, but the quantities are reduced to:

Flowers of sulphur	pounds	24
Unslaked lime	do	8
Water	gallons	100

Dangerous Formulæ.

7. California lime-and-sulphur dip:

Flowers of sulphur	pounds	100
Lime	do	25
Water	gallons	100

8. A very dangerous misprinted formula to be found in several books and journals, probably due to a typographical error:

Flowers of sulphur	pounds	100
Lime	do	150
Water	gallons	100

In case of fresh scab formula No. 6 will act as efficaciously as the dips with a greater amount of lime, but in cases of very hard scab a stronger dip, as the Fort Collins dip, should be preferred, or, in unusually severe cases, an ooze with more lime in proportion to the amount of sulphur, such as the Victorian (No. 1), the Nevada (No. 4), or the South African (No. 3) dip might be used.

Many other formulæ might be cited, but these are enough to show the great variations in the dips which have been used; and to prove that when a party simply states that "lime and sulphur" is an excellent dip, or that it is a dangerous dip, or that he has succeeded or failed with it, or that the lime-and-sulphur dip is injurious to the wool, his statements can not be taken as definite, unless he also states which lime-and-sulphur dip he used and how he used it.

Prejudice Against Lime-and-Sulphur Dips.

There is at present great prejudice (a certain amount of it justified, no doubt) against the use of lime and sulphur, emanating chiefly from the agents of patent or proprietary dips and from the wool manufacturers. It will be well therefore to consider the points brought forward by them against its use.

In the first place, it is frequently asserted that lime and sulphur does not cure scab. This statement is, of course, in the interest of proprietary dips, but it is based either upon an absolute ignorance or a misrepresentation of facts. Experience in Australia and South Africa, as well as in this country, has shown beyond any doubt that a lime-and-sulphur dip, when properly proportioned, properly prepared, and properly used, is one of the best scab eradicators known. Cases of its failure have been due to careless or improper methods of its preparation and use.

It is claimed by some that it produces "blood poisoning." But the cases of death following the use of lime-and-sulphur dips have been infinitesimally few when compared with the number of sheep dipped in these solutions and when compared with the deaths which have been known to follow the use of certain proprietary dips. The details of such accidents so far as they have been reported have not shown that death was due to any properly prepared and properly used lime-and-sulphur dip. If the formula of 100 pounds of sulphur, 150 pounds of lime, and 100 gallons of water has killed animals, that surely is no argument against the formula 33 pounds of sulphur, 11 pounds of lime and 100 gallons of water, but simply shows that the former formula is too strong; if any other conclusion than this is drawn, consistency would compel us to reject many of our most valuable remedies because some parties had used them in overdose. The argument frequently raised against lime and sulphur—namely, that "shear-cut" sheep die when dipped immediately after shearing in a lime-and-sulphur dip which has stood for some time—can be used equally well against other dips, and simply shows that it is safer to use a fresh supply of dip and to allow a short time to elapse after shearing before dipping. It is highly probable that the cases of so-called "blood-poisoning" of shear-cut sheep are generally due to an infection with bacteria in stale dip containing putrefying material. Some cases of death are also said to have occurred after using a lime-and-sulphur dip made in brass kettles.

In an experiment by this Bureau, 5 cc. of a clear lime-and-sulphur ooze (formula No. 6) has been injected under the skin of a sheep without producing any evil effects.

The greatest objection raised against the use of lime-and-sulphur dip is that it injures the wool. This objection is raised by many wool manufacturers, and echoed with ever-increasing emphasis by the manufacturers of prepared dips; while, after years of extensive experience with properly prepared dip, its injury to the wool is strongly and steadfastly denied by the agricultural department of Cape Colony.

It is believed that a certain amount of justice is attached to this objection to lime and sulphur as generally used; unless, therefore, lime and sulphur can be used in a way which will not injure the wool to an appreciable extent, we should advise against its use in certain cases; in certain other cases the good accomplished far outweighs the injury it does. Let us, therefore, examine into this damage and its causes.

The usual time for dipping sheep is shortly after shearing, when the wool is very short, whatever the damage at this time, then, it can be only slight, and the small amount of lime left in the wool will surely do but little harm.

In full fleece, lime and sulphur will cause more injury. In Australia the deterioration was computed by wool buyers at 17 per cent, although in Cape Colony the department of agriculture maintains that if properly prepared, and if only the clear liquid is used, the sediment being thrown away, the official lime-and-sulphur formula will not injure the long wool. In our own experiments we have found some samples of wool injured by dipping, while on other samples no appreciable effect was noticeable.

It must not be forgotten that other conditions, such as variations in the feed, pasturing on alkaline land, ill health from any cause, etc., may cause brittleness of the wool, which might be mistaken for the effects of lime and sulphur.

If a lime-and-sulphur dip is used, care must be taken to give the solution ample time to settle, then only the clear liquid should be used, while the sediment should be discarded. In some of our tests on samples of wool we have found that the dip with sediment has produced very serious effects even when no appreciable effects were noticed on samples dipped in the corresponding clear liquid.

Experience has amply demonstrated that a properly made and a properly used lime-and-sulphur dip is one of the cheapest and most efficient scab eradicators known, but its use should be confined to flocks in which scab is known to exist, and to shorn sheep, with the exception of very severe cases of scab in unshorn sheep. It should only be used when it can be properly boiled and settled. The use of lime-and-sulphur dips in flocks not known to have scab, especially if the sheep are full fleeced, can not be recommended; in such cases tobacco, or sulphur and tobacco, is safer and equally as good.

If a lime-and-sulphur dip is chosen, it is better for ordinary cases to use the solutions containing a small amount of lime and three times as much sulphur as lime, as the Fort Collins formula (33 pounds of sulphur and 11 pounds of lime to every 100 gallons of water) or the Bureau of Animal Industry formula (No. 6) (24 pounds of sulphur and 8 pounds of lime to 100 gallons of water), rather than the formula with a greater proportion of lime.

If the stronger solutions, as the Victorian formula (No. 1), or the present South African formula (No. 3), or the Nevada formula (No. 4) are used at all, their use should be confined to unusually severe outbreaks. Under no circumstances should the California formula (No. 7) or formula No. 8 be used. They are too strong, and the latter is especially liable to kill the sheep.

Another objection raised to the use of lime and sulphur is the claim that the "shrinkage" in the sheep after the use of these dips is greater than after the use of other dips. In reply to this objection, raised chiefly by patent-dip manufacturers, it can only be repeated that such has not been the experience of this Bureau (see p. 35), nor was it the experience of Professor Gillette in his experiments in Colorado. The burden of proof for the opposite statement, with exact statistics, rests upon those who raise this objection.

Still another objection advanced against lime and sulphur is that its continued use year after year will gradually decrease the annual clip. Whether this objection be valid or not, it is scarcely necessary to discuss it in detail in this place; for, in the first place, the average sheep raiser of this country does not keep the same sheep "year after year," but sends the most of his sheep (breeding ewes and the rams excepted) to market. Hence there will usually be little opportunity to injure the wool of a given animal "year after year." In the next place, if lime and sulphur are properly used one year, so that the flock is freed from scab and reinfection be guarded against, it will not be necessary to resort again to lime and sulphur.

These objections have been reviewed somewhat in detail in order to place the facts, so far as obtainable, before the farmer. It is not particularly advised by the Bureau that lime and sulphur be used in this country in preference to sulphur and tobacco, or tobacco alone, or any other effective dip. In fact, it is hoped that within ten years there will be no further use for the lime-and-sulphur dips. At the same time, where it is a choice, on the one hand, between lime and sulphur, with a temporary slight deterioration in the value of wool, but an absence of scab, and, on the other hand, the use of a secret and ineffective patent dip, with the continual presence of scab, and hence permanent deterioration in wool, there can be no doubt that the decision should be in favor of lime and sulphur (properly prepared and properly used).

All things considered, where it is a choice between sacrificing the weight of sheep, and to some extent the color of the wool, by using tobacco and sulphur, and sacrificing the staple of the wool by using lime and sulphur, the farmer should not hesitate an instant in selecting tobacco in preference to lime. The loss in weight by using tobacco and sulphur is not much greater than the loss in using lime and sulphur, while the loss in staple is of more importance than a slight discoloration.

Preparation of the Mixture.—Almost as many different methods of preparing the liquid exist as there are different formulæ, some of the methods laying great stress upon sifting both the lime and the sulphur, others laying great stress upon allowing the liquid to settle, others leaving out of consideration both of these points. The method which has been found in the Bureau to be the easiest and most satisfactory is as follows:

A. Take 8 to 11 pounds of unslaked lime, place it in a mortar box or a kettle or pail of some kind, and add enough water to slake the lime and form a "lime paste" or "lime putty." Many persons prefer to slake the lime to a powder, which is to be sifted and mixed with sifted sulphur. One pint of water will slake three pounds of lime if the slaking is performed slowly and carefully. As a rule, however, it is necessary to use more water. This method takes more time and requires more work than the one given above, and does not give any better result. If the boiled solution is allowed to settle the ooze will be equally as safe.

B. Sift into this lime paste three times as many pounds of flowers of sulphur as used of lime, and stir the mixture well.

Be sure to weigh both the lime and the sulphur. Do not trust to measuring them in a bucket or to guessing at the weight.

C. Place the sulphur-lime paste in a kettle or boiler with about 25 to 30 gallons of boiling water, and boil the mixture for two hours at least, stirring the liquid and sediment. The boiling should continue until the sulphur disappears, or almost disappears, from the surface; the solution is then of a chocolate or liver color. The longer the solution boils the more the sulphur is dissolved, and the less caustic the ooze becomes. Most writers advise boiling from thirty to forty minutes, but we obtain a much better ooze by boiling from two to three hours, adding water when necessary.

D. Pour the mixture and sediment into a tub or barrel placed near the dipping vat and provided with a bunghole about four inches from the bottom and allow ample time (two to three hours, or more if necessary) to settle.

The use of some sort of settling tank provided with a bunghole is an absolute necessity, unless the boiler is so arranged that it may be used both for boiling and settling. An ordinary kerosene oil barrel will answer very well as a small settling tank. To insert a spigot about three to four inches from the bottom is an easy matter. Draining off the liquid through a spigot has the great advantage over dipping it out in that less commotion occurs in the liquid, which therefore remains freer from sediment.

E. When fully settled, draw off the clear liquid into the dipping vat and add enough warm water to make 100 gallons. The sediment in the barrel may then be mixed with water and used as a disinfectant, *but under no circumstances should it be used for dipping purposes.*

A double precaution againgt allowing the sediment to enter the vat is to strain the liquid through ordinary bagging as it is drawn from the barrel.

In watching the preparation of lime-and-sulphur dips by other parties the Bureau investigators have found some persons who laid great stress upon stirring the sediment well with the liquid before using the ooze. This custom is undoubtedly responsible for a great deal of the prejudice which exists at present against lime-and-sulphur dips; and considering the preparation of these dips in this way there is no wonder at the immense prejudice against them in certain quarters.

To summarize the position of the Department on the lime-and-sulphur dips: When properly made and properly used, these dips are second to none and equaled by few as scab eradicators. There is always some injury to the wool resulting from the use of these dips, but when properly made and properly used upon shorn sheep it is believed that this injury is so slight that it need not be considered; on long wool the injury is greater and seems to vary with different wools, being greater on a fine than on a coarse wool. This injury consists chiefly in a change in the microscopic structure of the fiber, caused by the caustic action of the ooze. When improperly made and improperly used the lime-and-sulphur dips are both injurious and dangerous, and in these cases the cheapness of the ingredients does not justify their use. In case scab exists in a flock and the farmer wishes to eradicate it, he can not choose a dip which will bring about a more thorough cure than will lime and sulphur (properly made and properly used), although it will be perfectly possible for the farmer to find several other dips which will, when properly used, be nearly or equally as effectual as any lime-and-sulphur dip. There is no dip to which objections can not be raised.

POTASSIUM SULPHIDE DIP.

It has been proposed by several parties to use a potassium sulphide dip, and such a dip has been tried to some extent. As yet, however, judgment upon it must be reserved. Gillette tried a dip composed of 4½ pounds of potash lye, 16 pounds of flowers of sulphur, and 100 gallons of water, and promises further reports on its effectiveness. Sheep dipped in this liquid gained but 6 pounds, namely, the same as the sheep treated with carbolic dip.

TOBACCO DIPS.

The active principle of tobacco, upon which the tobacco dips depend for their action, is a poisonous substance known as nicotine. This poison when applied to animals externally in too strong solutions may cause nausea, fainting, and even death. The dog and the rabbit are particularly susceptible to its effects. Diluted to about thirty-three one-thousandths to sixty one-thousandths of 1 per cent it makes a slow but sure-acting and excellent sheep dip.

Unfortunately the percentage of nicotine varies greatly, not only in different kinds of tobacco, but also in different parts of the plants in different years, and even in different parts of the same package. There is more nicotine in the leaves, for instance, than in the stems. In fermented tobacco there seems to be a certain relation between the amount of nicotine and the amount of juice present, so that in general dry, thin leaves do not contain so much nicotine as thick, "fat" leaves. The variation in percentage of nicotine in different kinds of tobacco may be seen from the following table of determinations taken from Kissling, 1893:

Statement giving the name of tobacco and amount of nicotine in percentage of dry substance.

	Per cent.		Per cent.
Virginia	4.80	Brazil	1.14
Virginia	4.30	Turkish	2.51
Kentucky	4 50	Elsace	1.91
Sumatra	4.10	Elsace	0.92
Seedleaf	3.70	Maryland	1.26
Seedleaf	3.00	Maryland scrubs	1.17
Havana	3.00	Carman	1.18
Havana	1.90	Ohio Bay	1.06
Brazil	2.78	Ambalrma	1.17
Brazil Felix	2.73	Domingo	0.82
Brazil Felix	1.25	Ohio	0.68
Java	2.61		

In four carloads of stems, aggregating 127,273 pounds, one American firm extracted 1,405 43 pounds of nicotine, or 1.104 per cent.

While the above figures represent the percentages extracted in the chemical and manufacturing laboratories, they do not necessarily represent the amount which the farmer would be able to extract with the methods and apparatus at his disposal. On account of the variation in the amount of nicotine in the different samples of tobacco, it is practically impossible for the farmer to make up an exact desired strength of tobacco dip if he prepares his own mixture from the leaves. He can, however, prepare a mixture which will come within the limits necessary to kill the scab parasites. If a solution of an exact given strength is desired, it will be necessary to buy prepared nicotine, or prepared tobacco dips of a guaranteed strength and reduce them to the strength determined upon.

To prepare the tobacco dip from the leaves, it is best to use at least 21 pounds of leaves to every 100 gallons of water. Assuming that a tobacco leaf is used from which the farmer might extract 2 per cent of nicotine, the 100 gallons of ooze would contain slightly more than five hundredths of 1 per cent; to obtain 100 gallons of ooze of thirty-three one-thousandths of 1 per cent strength, it would be necessary to use 21 pounds of tobacco yielding nearly 1.3 per cent nicotine.

Directions for Preparing the Dip.—For every 100 gallons of dip desired, take 21 pounds of good prepared tobacco leaves; soak the leaves in cold or lukewarm water for twenty-four hours in a covered pot or kettle; then bring the water to near the boiling point for a moment and, if in the morning, allow the infusion to draw for an hour; if in the evening, allow it to draw over night; the liquid is next strained (pressure being used to extract as much nicotine as possible from the wet leaves) and diluted to 100 gallons per 21 pounds of tobacco. This dip should be used as fresh as possible, as it contains a large amount of organic material which will soon decompose.

The proportions here given, 21 pounds of prepared tobacco leaves to 100 gallons of water, have given very satisfactory results, especially in Cape Town colony, where the reports of the scab inspectors accord this homemade tobacco dip third place among the dips officially recognized. In regard to one of the proprietary tobacco dips the Cape Town agricultural department reports as follows: "Highly spoken of by several inspectors. Very efficacious, and improves the quality of the wool, making it soft and pliable. The one thing which militates against its general use is its expense, hindering the poorer farmers from using it. It is allowed to be one, if not the best, of the patent dips in use, and also the safest." By all means the use of a tobacco dip, or of the tobacco-and-sulphur dip, in preference to the lime-and-sulphur dips is advised in case the sheep to be dipped show no unmistakable signs of scab.

The advantages of the tobacco dip are that it is comparatively cheap, since the farmer can grow his own tobacco; that it is effectual and at the same time not injurious to the wool. The disadvantages of the dip are that it sometimes sickens the sheep; that it also occasionally sickens the persons who use it, especially if they are not smokers; it spoils very rapidly; it causes a greater setback than lime and sulphur, but less of a setback than carbolic dips.

ARSENICAL DIPS.

There are both homemade arsenical dips and secret proprietary arsenical dips. It is well to use special precautions with both because of the danger connected with them. One of the prominent manufacturers of dips, a firm which places on the market both a powder arsenical dip and a liquid non-poisonous dip, recently summarized the evils of arsenical dips in the following remarkable manner:

> "The drawbacks to the use of arsenic may be summed up somewhat as follows: (*a*) its danger as a deadly poison. (*b*) Its drying effect on the wool. (*c*) Its weakening of the fiber of the wool in one particular part near the skin, where it comes in contact with the tender wool roots at the time of dipping. (*d*) Its not feeding the wool or stimulating the growth, or increasing the weight of the fleece, as good oleaginous dips do. (*e*) The danger arising from the sheep pasturing, after coming out of the bath, where the wash may possibly have dripped from the fleece, or where showers of rain, after the dipping, have washed the dip out of the fleece upon the pasture. (*f*) Its occasionally throwing sheep off their feed for a few days after dipping, and so prejudicing the condition of the sheep. (*g*) Its frequent effect upon the skin of the sheep, causing excoriation, blistering and hardness, which stiffen and injure the animal, sometimes resulting in death."

Although this manufacturer has gone further in his attack upon arsenic than this Bureau would have been inclined to do, it must be remarked that when a manufacturer of such a dip can not speak more highly of the chief ingredient of his compound than this one has done in the above quotation, his remarks tend to discredit dips based upon that ingredient. It might be added that Bruce, the chief inspector of live stock for New South Wales, pays his respects to arsenical dips with the statement: "Arsenic and arsenic and tobacco (with fresh runs) cured 9,284 and failed with 9,271."

It may be said, on the other hand, that arsenic really has excellent scab-curing qualities; it enters into the composition of a number of the secret dipping powders and forms the chief ingredient in one of the oldest secret dips used. This particular dip has been given second place (with some qualifications) among the officially recognized dips in South Africa. In deference to the opinion of those who prefer an arsenical dip several formulæ are quoted here.

Formulæ for Arsenical Dips.—Finlay Dun recommends the following: Take three pounds each of arsenic, soda ash (impure sodium carbonate) or pearl ash (impure potassium carbonate), soft soap and sulphur. A pint or two of naphtha may be added if desired. The ingredients are best dissolved in 10 to 20 gallons of boiling water and cold water is added to make up the 120 gallons. The head of the sheep must, of course, be kept out of the bath.

A mixture highly endorsed by certain parties consists of the following ingredients:

Commercially pure arsenite of soda	pounds	14
Ground roll sulphur	do	34½
Water	gallons (U. S.)	432

The arsenite of soda is thoroughly mixed with the sulphur before being added to the water.

Precautions in Use of Arsenical Mixtures.—Any person using an arsenical dip should bear in mind that he is dealing with a deadly poison. The following precautions should be observed:

(1) Yards into which newly dipped sheep are to be turned should first be cleared of all green food, hay, and even fresh litter; if perfectly empty they are still safer. (2) When the dipping is finished, the yard should be cleaned, washed, and swept, and any unused ooze should at once be poured down a drain which will not contaminate food or premises used by any animals. (3) Dipped sheep should remain in an open, exposed place, as on dry ground. (4) Overcrowding should be avoided, and every facility given for rapid drying, which is greatly facilitated by selecting fine, clear, dry weather for dipping. (5) On no account should sheep be returned to their grazings until they are dry and all risk of dripping is past.

Suggestion as to Danger.—The formulæ given above are copied from the writings of men who have had wide experience in dipping, but this Bureau assumes no responsibility for the efficacy of the dips given or for their correct proportions. Furthermore, as long as efficacious non-poisonous dips are to be had, we see no necessity for running the risk attendant upon the use of poisonous dips.

CARBOLIC DIPS.

A carbolic-acid dip may be made at home or may be purchased as a proprietary article. This class of dips kills the scab mites very quickly, but unfortunately the wash soon leaves the sheep, which is consequently not protected from reinfection in the pastures. If, therefore, a carbolic dip is selected, it is well to add flowers of sulphur (1 pound to every 6 gallons) as a protection against reinfection.

The advantages of carbolic dips are that they act more rapidly than the tobacco or sulphur dips, and that the prepared carbolic dips are very easily mixed in the bath. They also seem, according to Gillette, to have a greater effect on the eggs of the parasites than either the sulphur or tobacco dips. The great disadvantages of this class of dips are, first, in some of the proprietary dips, that the farmer is uncertain regarding the strength of material he is using; second, the sheep receive a greater setback than they do with either lime and sulphur or tobacco.

Gillette reports most excellent results from the use of a certain prepared carbolic dip. The Bureau purchased the same dip upon the open market and tested its effects upon the sheep in the proportion recommended by the manufacturer on the label of the package and also in one-half and one third that strength. In the first and second tests the dip was severe both on the sheep and on the operators. In one case it caused a considerable, though temporary, eruption on the hands and arms of an operator. In all three cases the dipped sheep were almost overcome in the dipping tank, and upon recovering themselves ran around the field in an excited manner, bleating loudly and shaking their heads and tails. The eyes were more congested than we have ever seen them to be after a lime and sulphur or a tobacco dip.

An objection to some of the proprietary carbolic dips is that the manufacturers themselves apparently are little acquainted with their own mixtures. Their claims are extravagant and their directions often contradictory. It may be admitted that the carbolic dips are promising and that they may have a brilliant future, but they have not had a very brilliant past, and this Bureau is inclined to be extremely conservative in regard to them and to advise their manufacturers to prepare them in a guaranteed strength with more explicit directions for use than are to be found in the present circulars. The dip just referred to was certainly more severe in its effects on the sheep than can be justified by its quick action in killing the scab parasites, considering that other equally effective but milder solutions are to be had.

We also found in our tests (which are not yet fully completed) that the sheep have gained less in weight when dipped in certain two of these washes than when dipped in lime and sulphur, or in sulphur and tobacco, or in tobacco.

If a carbolic dip is used care must be taken that the ingredients form a thorough emulsion; if a scum arises to the top, a softer water should be used.

In justice to this class of dips it is only fair to state that while the views here expressed are entirely in accord with the opinions of some authorities, they do not agree with the views held by others; but they are based upon the material purchased in open market, and probably represent the experience of many who have used these dips. The investigations of the Bureau certainly show that more tests are necessary before this class of dips can be indorsed. It is hoped that these tests may be made in the near future.

One of the prominent proprietary carbolic dips was formerly recognized as one of the three official dips in New South Wales, but it has now been stricken from the list. In-

Cape Town carbolic dips are not much used, and in the official reports little is said concerning them.

SETBACK TO THE SHEEP FROM DIPPING.

Dipping often results in a slight setback. If sheep are weighed immediately before dipping, and again at the same hour the following day, it will be noticed that the weight has changed. There may be a gain, but usually there is a loss varying from one-half to three and one-half pounds. The second day there may also be either a gain or loss. As the weight of sheep varies from day to day, from one to five pounds in loss or gain, due chiefly to the increase or decrease of the amount of fodder and water in the stomach, the effects of dipping can not be estimated in twenty-four or forty-eight hours. In order to meet statements made concerning loss or gain in weight, this Bureau had sheep dipped at stated intervals, and the weights taken from week to week; all the sheep were kept under exactly the same conditions; the dips used were lime and sulphur, tobacco and sulphur, and two proprietary carbolic dips.

At the end of about two months, after three dippings, all of the sheep showed a gain, with the exception of one of the sheep from the carbolic dip, which lost slightly. The lowest gain among the sheep treated with tobacco dip was 3½ pounds, the highest 11½ pounds. The lowest gain among the sheep treated with lime and sulphur was 7 pounds, the highest 8½ pounds. The lowest gain among the sheep treated with the carbolic dip was 1½ pounds, the highest 3½ pounds, while one animal lost ½ pound. The sheep were given a fourth dipping, and at the end of another month showed the following gains and losses over their original weight at first dipping: Sheep treated with tobacco, 9 to 15 pounds gain; sheep treated with lime and sulphur, 11½ to 14 pounds gain; sheep treated with carbolic dip, 1 to 6½ pounds gain, in one case 13½ pounds lost.

The experiment was then repeated, the lime and sulphur being used on sheep previously dipped in carbolic or tobacco dips, and vice versa. After ten days the sheep treated with lime and sulphur had gained from 2 to 3 pounds; the sheep treated with tobacco had remained stationary or had lost from 1 to 1½ pounds; the sheep treated with carbolic dip had gained as high as 1 pound, or remained stationary, or had lost as much as 2½ pounds. At this point circumstances intervened which closed the experiments for the season.

Gillette has also made determinations of the loss of weight of sheep from dipping Part of his results agree with ours and part differ. The chief point of difference in opinion is that Gillette considers that the best conclusion can be based upon weights taken a few days after dipping, while we consider the weight at a later period as the better criterion. Gillette gives weights from November 17 to December 22, and taking the cases where the sheep have been dipped twice, we see from his tables that the carbolic sheep gained on an average 6 pounds, the sheep treated with tobacco gained 8 pounds, the sheep treated with arsenical dip gained 8 pounds, the sheep treated with lime and sulphur gained 9 pounds, while the sheep which were not dipped, in order to give a basis for comparison, gained 6 pounds.

Holding in mind that sheep may apparently gain or lose about three pounds per day when not dipped, it is seen from the experiments by Gillette, in Colorado, and by this Bureau, in the district of Columbia, that the oft-repeated claim that lime-and-sulphur dips give a greater setback than other dips is erroneous. In both the western and the eastern experiments the sheep treated with lime and sulphur averaged the greatest gain, the sheep treated with tobacco the second highest gain, while the carbolic sheep showed the lowest gain.

RABIES.

Rabies, as affecting our domestic animals, presents a very serious question for consideration. But one plan of certainly preventing recurrence of this frightful malady, to which man as well as the lower animals is susceptible, suggests itself to this Commission, and that plan is entirely impracticable. It would contemplate the suppression of all dogs in the State. After years of careful observation we express the deliberate conviction that only dogs communicate the disease. To this general proposition we add that it is quite probable that swine, in confinement, may from constant fighting with sharp teeth so lacerate each other that they may communicate the virus to each other. We presume the cat is capable of communicating the virus, but the cat is the only domestic animal that we have not yet seen affected with rabies. The reason probably lies in the fact that the rabid dog in his wild chase, in which he bites and snaps right and left every living thing coming within his reach, has probably seldom overtaken the lively cat. As before stated, none of our other domestic animals, with the exception noted, seem capable of communicating the virus. From the above, the successful control of an outbreak of rabies, after one has occurred, is apparent. All dogs within reasonable limit, located on both sides the line of travel, of a mad dog, should at once be killed, safely muzzled or securely tied. The first plan should be followed as far as practicable, because if absolutely followed there would be no farther spread of the malady. So as soon as any other domestic animal develops the malady it should be destroyed. Humanity dictates this plan of procedure, as treatment is utterly unavailing and the sufferings of the poor dumb brute, before death relieves it, are frightful to behold. Destroy no animal, except a dog, that is supposed to have been bitten. Await the appearance of the malady, and should it appear, act at once by destroying the affected animal.

TUBERCULOSIS.

Since the Sixth Biennial Report was issued, this Commission has applied the tuberculin test to nearly 1,000 head of cattle, a goodly proportion being milch cows. In fact, a larger number of cattle have been tested for tuberculosis during the last two years than had previously been tested since the tuberculin test was adopted by the Commission.

The tuberculin test is applied only when suspicion is directed toward, or complaint made of, either a single animal or an entire herd. The records of tests made show but a small per cent of infected animals, and when we consider the fact that only suspicious herds are tested, we feel safe in estimating that less than two per cent of the cattle in Michigan are affected with tuberculosis.

In following the plan of testing cattle with tuberculin to detect the presence of tuberculosis, a wide general field has been covered. We have tested suspicious herds scattered from the south line of the State to the shores of Lake Superior and the extreme western line of the upper peninsula. The experience obtained is a repetition of the experience of all investigations. That is, that this disease is highly contagious among cattle in the latitude and longitude of all the State of Michigan where herds are kept under favorable environments for its propagation and spread. No breed of cattle are exempt from its ravages. The contagious character of tuberculosis among cattle has been proven beyond a doubt in a multitude of individual cases throughout the country. This Commission is actively engaged in suppressing such outbreaks as are brought to its attention. It is our opinion that the cattle of the State are but little affected with this disease, but in herds where the disease has a foothold, and the conditions and environments are favorable to its development, a large percentage of the herd will be likely to be affected. We know of no cure for this disease, and have followed the policy of destroying or closely quarantining affected animals to arrest its farther spread.

Tuberculosis is the general name given to a class of diseases in animals of which consumption in the human family is a common type. This disease has been known ever since the advent of mankind, under many different names.

Tuberculosis in all its forms is caused by a specific microbe, and this microbe must be present ere this disease in its inception can come into existence. In 1882 Dr. Robert Koch, of Berlin, claimed the discovery and demonstrated the true and essential cause of tuberculosis—the tubercle bacillus. He also showed the bacillus present in all tubercular lesions. He isolated and cultivated the germs from tubercular tissue, and produced tuberculosis artificially in animals by inoculation with pure culture. At this time the Doctor was looking for a cure for consumption in the human family.

He failed in this effort, but a few years later produced and experimented with a "lymph" or "tuberculin," which has since become a valuable diagnostic agent in demonstrating the presence of tuberculosis in animals, even in the early stages of the disease.

Regarding the list of micro-organisms, it is stated as an undeniable fact that the bacillus tuberculosis, although the most infinitesimal of them all (about one ten-thousandth of an inch in length), is at once a despot and a millionaire. It will live in ice, maintain vitality at a temperature below 150 degrees F., resists moisture, drouth and decay, and bids defiance to the germicidal action of the gastric juice. It is the czar of all mankind, and is responsible for more deaths among the human race than any other germ, while more people die annually from consumption than from war, pestilence and famine.

HOW TUBERCULIN IS MADE.

It is made from a pure culture of the tubercle bacillus, highly concentrated, then filtered through porcelain, after being sterilized by heating to a high temperature to destroy any and all germs. It is in liquid form, diluted with glycerine and carbolic acid, and is furnished to our Commission by the Bureau of Animal Industry, of the Department of Agriculture, at Washington.

THE TEST.

In testing cattle for tuberculosis we take and record the average normal temperature of each animal during the first day. Several temperatures are taken, preferably two hours apart. The average normal temperature of cattle is about 101 degrees.

In the evening of the first day we inject two cubic centimeters under the skin of each full grown animal by means of a sterilized syringe. A smaller amount is injected into the system of younger animals, varying according to age and size. Commencing early the following morning, we take hourly temperatures of each injected animal during the day. Tuberculous cattle respond by a rise in temperature of two degrees or more from the twelfth to the twentieth hour after injection. A rise of two degrees over the normal temperature after injection indicates the presence of tuberculosis, unless there is some physical disturbance, such as the cows being in heat, near or recently past parturition; but if the animal is healthy, there should be no rise in temperature, and no possible injury to the cow.

During these tests the temperature is taken with tested or accurate thermometers. Much pains must be taken, and only experts should be allowed to make the tuberculin test. The hundreds of thousands of animals tested in this country, under the direction of competent veterinary surgeons, have shown this test, as a diagnostic agent, to be practically infallible in detecting the disease in the living animal.

The identity of tuberculosis in mankind and domestic animals being fully demonstrated, and being highly infectious, we now know that it is communicable from animals to animals, from animals to mankind, and from mankind to animals in return.

Tuberculin as a diagnostic agent is of incalculable value. At present we have no other sure means of detecting tuberculosis in cattle, even when well advanced.

DISEASES OF SWINE.

HOG CHOLERA AND SWINE PLAGUE.

On account of the similarity of the two diseases—hog cholera and swine plague—in symptoms, progress, fatality, and the impossibility of making a correct diagnosis of the diseases by a physical examination of the living animal or by a post-mortem investigation; the only means of detecting the difference of the two diseases being by a most intricate bacteriological examination and the culture of the germs, and as it has been found impossible to get anything like an approximate statistical data by which any definite conclusion of the relative destructiveness of the two diseases can be formed, we have heretofore treated them as one disease, under the common name of hog cholera, and for all practical purposes will continue to do so.

There have been many outbreaks of the disease in different sections of the State during the past two years, and the losses sustained by farmers have been very large, amounting in the aggregate to many thousand dollars. It is quite certain that many outbreaks of the disease have occurred in the State that have not been reported to the Commission, or action taken by the local board of health to arrest the spread of the contagion.

The government has employed scientific experts and spent large sums of money and many years in the investigation of the cause, nature and treatment of hog cholera, with very unsatisfactory results. There has been but very little important information gained and imparted by the Government Bureau of Animal Industry since our last report, except the experiments made with "antitoxic serum" in the inoculation of swine, which seems to promise important results, and will be treated hereafter.

In our Fifth Biennial Report we gave a very full statement of the nature and cause of the disease, cause of outbreaks, time of incubation of the germ after infection, symptoms of the disease from the time the germ begins its active work until death ensues, treatment as recommended by the Government Bureau of Animal Industry, how to guard against the disease, and how to disinfect the environments where sick swine had been kept; all of which we deem important to keep before health officers, veterinarians and farmers generally; we therefore reproduce the same here, with such additions and changes as our investigations and experience with the disease seem to justify.

HOG CHOLERA AND SWINE PLAGUE GERMS.

The following, compiled from the government reports, will no doubt be of general interest, and perhaps may serve to inspire greater dilligence in guarding against the diseases:

"Both hog cholera and swine plague are caused by bacteria, which have now been so carefully studied that they may be easily identified by persons accustomed to bacteriological researches. The hog cholera germs are slightly larger and more elongated than those of the swine plague, and are provided with long, thread-like appendages which enable them to move rapidly in liquids; while the swine plague germs have no such organs, and are unable to move except as they are carried by the liquid in which they float."

The result of the experiments shows that the germs of hog cholera find their way into the bodies of swine with the food and drink, by infection, through sores and flesh wounds, and by inspired air; while those of swine plague are taken almost entirely with the air and through the lungs. Hog cholera germs are very hardy and vigorous.

They are able to live for a long time and multiply in the water of ponds and streams. They may live in the soil for at least three months, and in accumulations of straw and litter for a much longer time. They withstand drying and other adverse conditions in a remarkable manner, and will survive in a frozen state for two or three months. On the contrary, the germs of swine plague are very delicate and easily destroyed. They soon perish in water or by drying, and every condition of life and growth must be more favorable than is required for hog cholera germs. "They are widely distributed and probably present in all herds of swine but without sufficient virulence to produce disease except by unusual connditions." On the contrary, the bacteria of hog cholera is not usually present, and must be introduced from infected herds before this disease can be developed.

The two diseases are sometimes found doing their destructive work together.

Cause of Outbreak: In every instance where definite information could be obtained, outbreaks of hog cholera, or contagious diseases among swine, have been traced to the importation of swine from other states or from infected districts in this State, or from railroads transporting diseased animals. There is no question but what the use of cars, in which diseased swine have been transported, for carrying other live stock and freight without being disinfected, is a fruitful source of many outbreaks of hog cholera. When the germ is once planted and the disease makes its appearance in a herd, its spread to other herds in the vicinity can only be prevented by exercising and enforcing the most careful and rigid measures. The disease may be carried from herd to herd, and from farm to farm, not only by "flesh devouring animals, birds and insects," but by water courses, through drain tile, heavy showers washing under fences and across enclosures, and on the wheels of vehicles and feet of persons and animals. A lump of soil or manure no larger than a mustard seed, adhering to the shoe of a person, or foot of a dog or other animal, may carry germs of the contagion sufficient to inoculate a herd of swine.

Time of Incubation: The time that elapses between infection and the appearance of the symptoms of illness, known as the period of incubation, varies from four to twenty days. During this period the germs are multiplying slowly, and gradually overcoming the vital powers of the animal by means of the poisonous substances which they produce as the result of their growth.

Symptoms of the Diseases: "There is first seen the signs of fever, shivering, unwillingness to move, more or less loss of appetite, elevation of temperature which may reach 106 to 107 F.; the animals appear stupid and dull, and have a tendency to hide in the litter or bedding and remain covered by it. The bowels may be normal or constipated at the beginning of the attack, but later there is generally a liquid and fetid diarrhea, abundant, exhausting, and persisting to the end. The eyes are first congested and watery, but soon the secretion thickens, becomes yellowish, accumulates in the angles and gums the lids together. The breathing is more rapid than usual and may be oppressed and labored in the latter stages. There is a cough, which, however, is not very frequent, and generally heard when the animals are driven from their beds. It may be a single dry cough, or it may be paroxysmal. The skin is often congested and red over the abdomen, inner surface of the limbs, under surface of the neck, and on the ears. The color varies from a pinkish red to dark red or purple. An eruption is sometimes seen, which leaves crusts or scabs of various sizes over the skin. There is rapid loss of flesh, the animal grows weak, stands with arched back and abdomen drawn up, and walks with a tottering, uncertain gait. There is less and less inclination or ability to move, and the weakness and exhaustion increases until death ensues."

The symptoms of swine plague are not noticeably different from those of hog cholera, except in the former the breathing is sometimes more oppressed and difficult, and the cough more frequent and painful. As the agents which destroy one of these germs will generally destroy the other, the difficulty of distinguishing between them is therefore of no great importance in the practical work of controlling them.

Treatment of Hog Cholera and Swine Plague: Will the diseases yield to treatment? And if so, what are the remedies? These are the questions which most interest farmers and swine growers. It is safe to say that there has never been discovered a remedy for any of the infectious diseases of man or animals which will cure every case. Some forms of these diseases are so virulent and rapid that the animals are past help before they are known to be sick, hence there is no time to apply remedies with beneficial effect.

In many outbreaks the type of the malady is less virulent and there is time to treat the animals after well developed symptoms of the disease are present, and the whole herd, after some of the swine are sick. The government experiments of 1894 seem to indicate with some degree of certainty, that treatment if properly applied may be successful, and the following formula is recommended:

Wood charcoal	1 pound
Sulphur	1 "
Sodium sulphate	1 "
Antimony sulphide	1 "
Sodium chloride	2 pounds
Sodium bicarbonate	2 "
Sodium hyposulphite	2 "

These ingredients should be completely pulverized and thoroughly mixed.

Dose, one large tablespoonful of the mixture once a day for each 200 pounds weight of the hogs to be treated. The medicine should be given in soft feed, as corn meal or ground oats, or crushed wheat, mixed with bran, or middlings well moistened with hot water.

Animals that are too sick to eat the mixture, should be drenched with the medicine, well shaken up in water. This can be done by slipping a noose over the upper jaw or snout of the animal and elevating its head sufficient to allow the medicine to be poured from the horn or drenching bottle into the corner of the mouth. Pull the cheek away from the teeth and let the medicine run into the pouch thus formed. Great care should be exercised in drenching hogs or they may be suffocated. The medicine should be poured slowly and time given for the animal to swallow. This medicine is also recommended as a preventive to these diseases, and for this purpose should be put in the feed of the whole herd, taking care that each animal receives its proper share. It is also claimed to be an excellent appetizer and stimulant to the processes of digestion and assimilation, causing unthrifty hogs to assume a thrifty condition and take on flesh.

It must not be forgotten that in order to secure good results from this treatment, diseased animals must be kept in dry and comfortable quarters and fed on soft and easily digested food. The sick should be separated from the herd, but the sick and well should be treated alike, in order to cure the former and prevent the incubation of the disease in the latter; for prevention is cheaper and more satisfactory than medical treatment.

Care to Guard Against the Disease: Healthy swine should not be allowed to come in contact with diseased animals or herds, strange swine the history of which is unknown, offal from establishments using carcasses of swine, recently infected ground or buildings, railroads carrying swine, or polluted streams. When the disease has actually appeared in a herd, heroic measures should be resorted to at once, to stamp it out and prevent its spread. The herd should be rigidly quarantined and as far as possible, all means for conveying the germs of the disease to other herds, should be guarded against. All dead animals should be deeply buried, or burned at once, and vehicles upon which they are carried away disinfected. The yards and premises where diseased swine are kept should be repeatedly and thoroughly disinfected, and when vacated not only disinfected but closed up from all other animals until there is reason to believe that the germs have been destroyed. Mere freezing does not kill the germ; but the disease usually dies out during the winter, if the frost can penetrate the litter and soil in every portion of the yards and under the buildings where the diseased animals have been kept. The germ is often protected during the winter by straw stacks and litter in the yards and under the buildings.

How to Disinfect: The following disinfectants are recommended:

1. Slacked lime, in the proportion of one-half pound lime to one gallon of water.
2. Equal volumes of crude carbolic acid and ordinary sulphuric acid mixed together, and two ounces of the mixture added to a gallon of water.
3. Sulphuric acid added to water, one ounce to a gallon.
4. Boiling water, where the application can be made direct.
5. Corrosive sublimate (mercuric chloride), in the proportion of one dram to a gallon of water.

The lime is the best and cheapest where it can be used. No. 2 is said to be more active. Place the vessel containing the crude carbolic acid in cold water and then add the sulphuric acid, to prevent undue heating of the liquid. The solution should be made in wooden vessels, as sulphuric acid and corrosive sublimate attack metals. As corrosive sublimate is very poisonous, the solution should not be made stronger than indicated. Each of the solutions recommended is strong enough to kill hog cholera and swine plague bacteria.

ANTITOXIC SERUM.

The Government Bureau of Animal Industry has been dilligently at work for several years, in preparing and experimenting with a serum for the treatment of hog cholera, with very encouraging results. The serum now used is a mixture of hog cholera serum and swine plague serum, and is equally beneficial in both diseases. The experiments made in 1897 saved about 80 per cent of the animals treated, and the inoculation of about 2,000 head in 1898 in diseased herds, gave about the same results. Therefore we may reasonably expect that a remedy, that will save a large per cent of swine affected with or exposed to hog cholera, will soon be available for practical use.

The government has not yet provided for the manufacture of the serum for distribution, and it is now prepared only for experimental work. If the experiments now going on prove as successful in curing and preventing the disease as those in the past have done, some approximate idea can be formed of the benefit which will result to farmers, when we consider that the estimated annual loss of swine by hog cholera in the United States is $100,000-000.

State Herds: But three outbreaks of hog cholera have occurred among the State herds, kept at the several State institutions, since our last biennial report; and by the prompt and thorough action taken by those having them in charge, the disease was soon stamped out without serious loss.

SUGGESTIONS TO FARMERS AND HEALTH OFFICERS.

Experience with the disease and increased knowledge of its nature, virulence and communicability, have enabled the Commission to institute measures to confine it, sometimes to the herd where the outbreak occurs, and often to a very limited area.

The following suggestions may be useful to farmers generally, and to local health officers:

Farmers should watch their swine carefully, and if symptoms of the disease as heretofore given, appear, separate the well from the sick at once, putting the well ones into new dry quarters, and keep the ground or floors of both pens well sprinkled with fresh slacked lime; and treat both sick and well with the formula heretofore given. If symptoms of the disease appear among the well, remove them at once to the sick pen. Both sick and well should be in enclosures so separated from each other that neither vehicle, animal or fowls can pass from one pen to the other. When the feeder has occasion to go among the sick, he should put on rubber overshoes, and remove, wash and disinfect them on coming out. When an outbreak of the disease occurs, it should be reported at once to a health officer of the township, who should forthwith proceed to quarantine all affected herds and notify owners of swine in the vicinity to take thorough measures to protect their herds from the infection. The health officer should also notify a member of the Live Stock Commission of the outbreak of the disease and the action taken. The Commission will then confer with the local health officer by correspondence, and by personal visit if deemed necessary, and take such measures as the case may seem to demand, to stop the spread of the contagion.

Local health officers having the quarantine of diseased herds in charge, should be vigilant and watchful in enforcing sanitary measures, and report to the Commission the final result of the action taken. The following quotation is from such a report, made by the health officer of Monterey, Allegan County, to a member of this Commission: "I know of no recent cases. Eighteen different herds were affected. Most of them, 418, died.

I think no new lots were taken after your visit. At the time of my first canvass 308 had died, and about 50 more were sick at the time. I think no new lots took it after I first went around. Had all dead hogs burned. *I think it much better than burying.*"

This report indicates thorough work by the health officer, and the result most gratifying, It will be seen that the disease had spread to eighteen different herds before any action was taken, and its further progress was stopped then and there. Had early action been taken, much of the loss could have been saved. The health officer is correct in recommending *burning* when practicable, instead of burying the dead hogs. Other reports of similar results could be mentioned, but the above will suffice. The Commission will be prepared to use the antitoxic serum remedy as soon as the serum can be obtained.

The report of the State Veterinarian is herewith submitted and attention called thereto.

H. H. HINDS,
J. J. WOODMAN, } State Live Stock Sanitary Commission.
J. H. BROWN.

Lansing, Michigan, March 9, 1899.

REPORT OF STATE VETERINARIAN.

HON. H. H. HINDS, *President Michigan Live Stock Sanitary Commission.*

SIR—In submitting the Seventh Biennial Report of the State Veterinarian I find that the general health of the live stock of this State compares very favorably with any other state or country on this great continent. Owing to the watchful care exercised by the State Live Stock Sanitary Commission and the aid rendered by my worthy predecessor, Prof. E. E. A. Grange, glanders among horses has been almost entirely obliterated from the State, there being probably not more than ten per cent. of this destructive and dangerous disease in existence in comparison with what existed a few years ago. Since assuming the duties of State Veterinarian, I have been called to many different parts of the State for the purpose of investigating reported outbreaks of contagious disease, and in the majority of cases of reported glanders, we are generally able to trace their origin to some transient animal that has found its way in from some other state. Although a considerable number of cases have been reported as suspected glanders, I have only found it necessary to condemn but eight animals in a period extending over nearly two years. When we consider the number of horses owned in the State, and the fact that at the time the Live Stock Sanitary Commission was organized, this loathsome disease prevailed in every county in the State and to an alarming extent in some localities, the work of the Commission must commend itself to the people, and especially to the live stock owners of this commonwealth. While glanders and farcy among horses have been the principal diseases reported for my inspection, there have been several cases of malignant influenza, or catarrhal fever, that have been arrested in their progress throughout the locality where the outbreak occurred, by a temporary quarantine and proper antiseptic and sanitary measures.

DISEASES OF CATTLE.

TUBERCULOSIS.

Owing to the widespread dissemination of this disease and its insidious nature, there was much difficulty experienced in diagnosing the disease in its incipient stages until the tuberculin test was instituted and introduced into the State by the Commission. Since that time the people of the State, from the study of some of your biennial reports and bulletins from the Experiment Station, have become aware of the dangers of this disease and alive to the advantages of the tuberculin test, thus enabling them to weed out the diseased animals from the healthy portions of the herd, and by using vigorous antiseptic precautions, checking the further spread of the disease, and at the same time destroying all chances of communicating it to the human family through the medium of tuberculous meat or milk.

Owing to its unknown beginnings, and its insidious march through the various organs of the animal economy before the owner's suspicion is aroused, many such animals have been purchased and brought in from the eastern states, where tuberculosis has prevailed to a great extent, for a number of years.

The disease has been widely distributed over this State, and although there is only a very small percentage of the cattle of the State affected, it is so distributed that I feel safe in stating that it is very doubtful if any county in the State is entirely free from it.

Under instructions from the Commission, I have applied the tuberculin test to about 900 head of cattle, and have had fifty-three reactions, showing about sixteen per cent. affected, and post mortem examinations have revealed the disease in every case of reaction.

ACTINOMYCOSIS.

Another infectious disease of cattle to which my attention has been called a number of times in the past two years is actinomycosis, or lumpy jaw, as it is frequently termed. It is caused by a fungus, called the *Actinomyces bovis*, which generally leads to the development of tumors about the head or neck and which may also attack the lungs or other organs. The actinomyces or ray fungus, as it is termed, is a vegetable parasite or fungus. It was first studied by Bollinger, and its effects demonstrated in the production of disease in 1877. This fungus grows in nature upon various plants, especially upon the heads of barley and other grains and grasses. The beards and straw of the affected plants contain the parasite, and when a puncture of the skin or mucous membrane occurs the fungus is introduced and the disease starts from this point of inoculation. A favorite place for the multiplication of the germ is the connective tissue beneath the skin of the jaw. In some cases the fungus appears to gain entrance to the interior of the blood vessels, where it is carried throughout the body with the blood, and the diseased process is found progressing in a considerable number of organs. Some eminent authorities claim that the fungus occasionally penetrates the body through the orifices of the teats, and in this case sets up inflammation of the udder. In some cases the disease begins in the interior of the bone, the parasite having gained an entrance through the alveolus of a tooth. In such cases we find the maxillary bone enlarged to a great extent before a soft tumor makes its appearance on the outside. In the ordinary forms of the disease we find the tumor confined to either the upper or lower jaw or on other parts of the head and neck, but there is a possibility of its development in any of the organs of the body, such as the lungs, liver, mesenteric glands, etc.; and in such cases it closely resembles the lesions of tuberculosis, the microscope being necessary to determine the true nature of the disease. This disease, if taken in time, will yield to treatment in a majority of cases by the free use of iodide of potassium in doses of from one and one-half to two and one-half drams (according to the size of the animal), given in the form of a drench, once per day. Care should be taken not to administer this drug to animals in advanced pregnancy, as there is danger of producing abortion. There is a difference of opinion among the best authorities in regard to the contagiousness of the disease under natural conditions, but it is certain if animals with this disease are allowed to run over the pastures, especially when they have a discharging tumor, the infectious principle is perpetuated to a great extent. It is not definitely known whether the human family can contract this disease by eating infected meat, but as cases of it have been observed in man, it would be wise to condemn all carcasses of such animals as unfit for human food.

SYMPTOMATIC ANTHRAX OR BLACK QUARTER.

I very much regret having to report an outbreak of another very fatal disease of cattle, which has recently made its appearance in this State, and although its ravages have been confined to a few herds, the fact that it has made its appearance in three different counties, proves conclusively that it may yet be a cause of grave apprehension to breeders of cattle.

Symptomatic anthrax or black quarter may be defined to be a rapidly fatal infectious disease due to the presence of a minute bacilli resembling the bacilli of true anthrax, but smaller in size. It also possesses the power of forming a spore within itself. This is a very important factor in relation to the disease. While the bacilli themselves have little power of resistance to heat, light or atmospheric influences, the spores resist destructive agents for a considerable length of time, and may still produce the disease when inoculated after several years of drying.

These bacilli are known to exist in the ground in certain localities, and experiments have been made by inoculating animals with the mud of swamps, where the disease has been known to exist, the disease being produced in this manner. Since the disease may be produced by placing under the skin material containing the specific bacilli and spores, it is safe to assume that cattle contract the disease, mainly through wounds, which may be only slight abrasions, either of the skin, mouth, tongue or throat. Any slight abrasion made by the sharp points of hay or coarse food may be sufficient for the virus to find access. These spores may be carried into the stable from the field with the food, and as soon as they come in contact with a susceptible animal favorable for their incubation, may cause the disease. There are certain pastures in some countries where the disease makes its appearance regularly every year, but as to any peculiarities of the soil in these localities, nothing is definitely known. Some authors are inclined to regard moist, underdrained and swampy pastures favorable to the disease. I might say that its first appearance in this State led me to incline to this opinion, but later developments have led me to believe that this is not invariably the case, although as yet my opportunities for studying it in this State have been fortunately limited. My attention was first called to it in the month of October last, when it developed on the farm of Mr. John Bryant, in Lenawee county, this State, where it proved fatal in every case and destroyed twenty-four head of cattle in eight days. As it had proved so rapidly fatal that I had no opportunity of studying it in the living animal, I was at a loss to determine whether it was sypmtomatic or true anthrax, but by a careful post-mortem examination and the aid of a bacteriological investigation, I was thoroughly satisfied that we had only the symptomatic anthrax to deal with. And as I had already had the unaffected animals removed to another pasture, I awaited further developments, but no further cases occurred, although there were six susceptible animals left. The disease again made its appearance in the month of December, in Branch county, when six valuable Jersey cattle succumbed to its influence, but at this time, under the direction of the Commission, I took active measures by way of preventive inoculation to arrest its further spread, and I am very happy to be able to report to you that the desired end seems to have been accomplished.

The virus used in this inoculation was kindly furnished by Park, Davis & Co., of Detroit. I have every reason to place the utmost faith in the efficacy of this preparation, and would advise all owners of cattle, in case of the appearance of this disease, to adopt this preventive inoculation without delay.

I will briefly describe the symptoms of symptomatic anthrax or black quarter, which are both local and general in their nature, and are said to begin from one to three days after infection has taken place. The animal appears dull and debilitated, with loss of appetite and rumination, and considerable fever, with lameness, or stiffness, of one or more limbs, due to a tumor or swelling that invariably accompanies the disease. After a period of from one to three days the affected animals almost always succumb. As the disease advances the weakness increases, accompanied with difficult breathing and attacks of severe spasmodic pain at intervals. In from two to eight hours after the setting in of the constitutional symptoms, a tumor or swelling will appear under the skin of the affected animal, which may take place either in the fore or hind quarter; it may be in the shoulder or neck, even as far forward as the throat, or it may be high up on the hind quarter or about the flank, but is never seen below the knee or hock joint.

This tumor, which appears very sore and painful at first, spreads very rapidly, both in depth and extent. In stroking it with the hand a crackling sound is heard beneath the skin, due to a collection of gas formed by the rapid multiplication of the bacilli. The muscular tissue beneath the skin is generally a dark red, brown or black, and is easily broken down. There is one distinguishing feature between the post-mortem appearance of this disease and true anthrax, which will be noticed in the ready clotting of the blood, which is not the case in true anthrax, and also in the condition of the spleen, which in this disease differs very little from the normal, but in true anthrax it will be found very much enlarged.

TREATMENT.

Remedies seem to be of no avail in this disease, consequently the only sure method to pursue would be to change the environments as quickly as possible and apply the preventive inoculations to the unaffected animals, in order to render them immune, as they may be subject to the same cause that produced it in other members of the herd.

DISEASES OF SWINE.

While there has been a considerable amount of hog cholera and swine plague reported from different parts of the State, I do not think that their ravages have been as great as in some former years. As the nature and symptoms of this disease have been fully explained in former reports it is not necessary for me to include it in the present report. I might state that I have only investigated a few outbreaks of swine disease, and while several of these bore unmistakable evidence of hog cholera, I believe that in one locality a disease appeared that is not identical with either hog cholera or swine plague. This disease differed from the others in the outward symptoms and internal lesions, and a bacteriological examination showed an entirely different germ. I am inclined to the opinion that we have a form of infectious pneumonia, that if taken in the first stages might readily yield to treatment. However, a further investigation into the nature of this disease would be advisable, if other outbreaks of a similar type make their appearance.

PREVENTION.

In regard to the prevention of hog cholera, there are many obstacles to contend with when it breaks out in a certain locality, as the germs can easily be carried by attendants on their clothing or boots, also by dogs, and even carrion birds. The immediate destruction by burning or deep burial of all animals that die with the disease and the strict quarantine of all affected herds, are the only safe measures of prevention. The Bureau of Animal Industry recommends a thorough inspection of all slaughter houses, contending that they are one of the greatest factors in the spread of this and other contagious diseases.

TREATMENT.

There is no specific remedy for either hog cholera or swine plague. In all probability there is nothing more effectual at present than the formula recommended by the Bureau of Animal Industry, and published in a former report of your Commission.

DISEASES AMONG SHEEP.

There seems to have been very little trouble among the sheep of the State since the last Biennial Report of the State Veterinarian, as only a few cases have been reported to this office, and those reports were confined to the one contagious disease, viz., scab. This disease, upon investigation, proved to have been brought into the State by feeders who had purchased western sheep that had been improperly dipped, and a few of these sheep, not getting fit for market, were kept through the summer, and in one flock in particular the disease had broken out in a considerable degree.

The owner, when made aware of the nature of the disease, proceeded at once to a thorough course of dipping of the flock and disinfected the pens, feeding troughs, etc., and succeeded in arresting and curing the disease, and as a further precaution fattened the whole flock for market.

It would be well to urge upon the public the necessity of a thorough course of dipping of all western sheep brought into the State, as I believe at present our native sheep are free from scab; but careless importation of western sheep might scatter it broadcast through this great wool-producing State and do an immense amount of damage to our sheep industry.

In submitting this report I wish to express my gratitude to the several members of the Commission for the courteous treatment I have received at their hands in the discharge of my duties under their direction, and also to the people of the State for the generous support they have afforded me in my investigation. I am convinced that the people of the State regard the Live Stock Sanitary Commission as their true benefactors, believing their work will benefit the health and enhance the wealth of the people of this great commonwealth.

I wish also to acknowledge my indebtedness to Prof. Charles E. Marshall, of the Experiment Station, Agricultural College, for the great assistance he has rendered me in making bacteriological investigations.

All of which is respectfully submitted,
GEO. W. DUNPHY, V. S.,
State Veterinarian.

EIGHTH BIENNIAL REPORT

OF THE

LIVE STOCK SANITARY COMMISSION

FOR THE

YEARS 1899 AND 1900.

BY AUTHORITY

1901
WYNKOOP HALLENBECK CRAWFORD COMPANY OF LANSING, MICH.
STATE PRINTERS.

STATE LIVE STOCK SANITARY COMMISSION

MEMBERS OF THE COMMISSION

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STATE VETERINARIAN

GEO. W. DUNPHY, V. S.,	QUINCY, MICHIGAN

REPORT

OF THE

STATE LIVE STOCK SANITARY COMMISSION

FOR THE BIENNIAL PERIOD OF 1899 AND 1900.

HON. A. T. BLISS, *Governor of Michigan:*

SIR—The State Live Stock Sanitary Commission have the honor to offer the following report for the two years of 1899 and 1900:

Under the workings of our efficient sanitary laws the farmers of Michigan have been exempt from any serious losses from contagious diseases among their farm animals. The one possible exception to this assertion might be hog cholera and swine plague. With this most contagious of diseases with which we have to contend, we confess our inability to cope farther than to assist in preventing the spread of the contagion. In another part of this report we treat more fully upon this topic, and the writer feels safe in saying that if, at the first appearance of the disease in any locality, the matter will be promptly reported to this Commission and the instructions laid down in our "Hog Cholera Bulletin" be carefully heeded, the disease may be confined to its initial quarters and its ravages reduced to a minimum. I am willing to go on record as saying that not one dollar is lost by the farmer of today from animals diseased by contagion, where an hundred were lost at the passage of the law in 1885 under which we now operate. In fact more monetary losses were sustained by the people of the city of Detroit alone from Texas or splenic fever in one year than is now sustained by the whole people of the State of Michigan from all contagious diseases combined. That Michigan has one of the most effective sanitary laws in the United States is attested by our comparative immunity from losses, and also by the fact that the United Staes government have proceeded along the almost identical same lines in stamping out splenic fever and some other diseases as was inaugurated by this Commission. Under this system the State of Michigan, which prior to the passage of this law was losing thousands of dollars annually by Texas fever, the poor people in the city of Detroit alone having lost more than $10,000 in a single year, has not had a case within her borders in nearly or quite a half score of years, and not a dollar loss to the people of this State in a longer period than that, the only cases having occurred for many years having been by the dumping of some cattle infected with the "ticks" at a way station by one of the trunk lines crossing our State, but under the prompt action of this Commission the matter was confined to a limited area, and the railroad were glad to escape by paying every dollar of the losses.

Glanders, while cropping out in isolated cases, is not prevalent and is not a serious menace, we have but one treatment of this loathsome disease—a relentless war of extermination. Actinomycosis is with us, and like "the poor," always will be, but we feel perfectly competent to handle it and our losses will not be great. Tuberculosis is a more serious menace, and until such time as we may have additional legislation we shall not make material headway in stamping it entirely out. Such outbreaks, however, as have been brought to our notice have been successfully handled, and we are of the opinion that notwithstanding the immense expenditure of money in some of our sister states, Michigan is as free from the disease perhaps as any state in the union. With additional legislation along this line and the co-operation of our farmers, there will be little danger of its becoming a serious menace. Foot-rot and scab, formerly considered the only disease the good shepherd had to contend with, are giving us but small concern. They are easily handled, and if reported promptly to this Commission will be handled without comparative loss to the flock owner. The most serious menace confronting the flock owner of today is the alarming increase of parasitic troubles. This is more fully treated of in another part of this report, as also in the report of the State Veterinarian attached, and is worthy of close attention. In conclusion allow me to say that while additional legislation is absolutely necessary to successfully cope with the question of tuberculosis, Michigan has just reason to felicitate herself upon her efficacious sanitary laws. We have seen the state of Illinois spend hundreds of thousands of dollars and other states sums nearly as vast in the attempt to stamp out contagious pleuro pneumonia, while Michigan, lying directly in the line of transit for the cattle of commerce from west to east, has, owing to our efficient quarantine regulations, never had a case within her borders. Pennsylvania and New York have probably spent more dollars than we have pennies in their frantic effort to exterminate tuberculosis. Today they probably have ten cases of the disease to where we have one. Other states have refused to allow Texas cattle to come into their state at all. We receive them for slaughter by the thousands, but under the restrictions imposed by this Commission not a case of loss to the citizens of the State for a dozen or so of years. Sheep from the scab infested districts of the west come to our feed lots by the tens of thousands, yet our native flocks are free from the disease. With all this immunity from losses the expense to the State is less than that, with a single exception, of any other state in the union having enforced sanitary laws, and we have a modest conceit that the citizens of this State have just cause to be proud of the existing conditions.

RABIES—HYDROPHOBIA.

During the two preceding years rabies have given us but small concern. That it has not become more prevalent is a matter of some surprise to this Commission and not less of congratulation. Only three times in two years has this disease been reported, and the Commission are not fully satisfied that in more than one instance was the disease genuine hydrophobia. Very early in the spring of 1900 there came a report from an interior village that mad dogs were abroad. Upon investigation it was found that several dogs had died with symptoms so closely resembling rabies that the Commission felt warranted in taking somewhat stringent measures. Quarantine regulations had been made by the common council which we found quite commonly disregarded. We thought it necessary to quarantine every suspect until such time as we could prove to a certainty that the disease did or did not exist. Subsequent developments proved the wisdom of this course. We at the same time made the following appeal to the citizens of the place:

To the citizens of .... and vicinity:

Owing to the deplorable conditions existing among the canines of this village the Michigan Live Stock Sanitary Commission make this direct appeal to the citizens. While it has not, in our opinion been fully demonstrated that the disease existing here is rabies, the symptoms in many cases are so exactly typical and its prevalence so wide-spread that the situation is truly alarming. It is not the wish of this Commission to oppress any individual, but we believe that all good citizens will concur with us that it is far better to err on the side of precaution than to be guilty of an official stupidity that will endanger the lives of valuable domestic animals or loved children. Two of the dogs that have died exhibiting all the symptoms of the prevailing malady have been sent to Prof. Chas. E. Marshall, Bacteriologist of the Michigan Experiment Station, and a thorough demonstration will be made. Owing to the fact that the germ rabies has, we believe, never been isolated, and scientists do not recognize it microscopically, inoculation must be resorted to, and will require several days, perhaps weeks, for its demonstration. Some inconvenience will be unavoidable, but let us be patient and charitable, rigidly quarantining every domestic animal that is even suspected of having been infected until such time as public safety may admit of their being given freedom. Any inquiries to this department will be cheerfully answered. While the common council unquestionably have the right to make such regulations as they deem necessary to public safety, and enforce them, we believe them dominated only by a spirit of right and justice. We wish further to say that all persons complying faithfully with our quarantine regulations will not have their dogs destroyed by order of this Commission until such time as all shadow of doubt shall be removed as to the nature of the disease. Public acts, 1889, 125, Sec. 15, provides penalty for evading quarantine regulations of this Commission.

The citizens of this village responded very kindly to our appeal.

About 28 days later we received the following report from Prof. Marshall:

Dear sir—I am now able to report to you the existence of rabies in the dogs used in the first examination. Two rabbits died today from inoculation. These two rabbits were inoculated at the same time, and have died within a few hours of each other.

Very respectfully,
CHAS. E. MARSHALL.

Prompt measures were taken to destroy all dogs that were known to have been bitten, and suspects were held in quarantine under the supervision of the city marshal until all possible danger was passed. Now the entire loss in this village was caused first by a single dog that came through the vicinity and bit three others, who in turn transmitted the disease to their mates in their frenzy, causing the loss of a half score or so of dogs, some of which were highly prized animals, and also of one horse bitten in the nose by a frenzied lap dog. Had there been sufficient local regulations to have safely secured these three first bitten the malady would have stopped there, hence I wish to urge upon all local boards of health that rules and restrictive regulations be framed and published now. Do not wait for a mad dog to come along, but proceed at once and be prepared for an emergency. In a supplement to the report of the State Board of Health for 1895 I find the following, which is so applicable to the present condition that I shall reproduce it:

RULES AND REGULATIONS SHOULD BE FRAMED AND PUBLISHED.

One of the most efficient means employed for the restriction of the spread of rabies is a set of rules which shall regulate the action and movement of animals infected with the disease. Each local board of health should frame and publish (in accordance with the State laws) rules which would enable the health officer to act promptly upon the appearance of a case of this disease so dangerous to the public health and life. If a health officer is obliged to wait until the local board can be called together the disease may have been allowed to spread instead of restricting it to the first case. On the occurrence of a case of rabies the fact should be reported to the local health officer and promptly restricted by him in accordance with act 137, laws of 1883. The health officer should, in compliance with sections 5 and 6, act 125, laws of 1889, report the fact to the Live Stock Sanitary Commission. The local health authorities should isolate the animal or animals and keep them so until they are taken care of by the State Live Stock Commission or State Veterinarian; but under no circumstances should the local health authorities fail to guard the public health and life. Whether in man or animals the full fact regarding the outbreak of the disease should be reported to the secretary of the State Board of Health at Lansing. In the cities the "dog ordinance" generally regulates the action of animals most likely to be infected with rabies. Every city should be equipped with an efficient ordinance and should demand its strict enforcement. An ordinance may be ever so efficient, but if not enforced, is useless, and the stray and ownerless dogs will be permitted to roam about the cities to become infected with rabies and transmit the disease to human beings. For the restriction of the spread of rabies and hydrophobia, it is important that prompt action should be taken with any suspicious animal. When a dog or other animal acts strangely and there is suspicion of madness, the animal should be immediately confined, not killed, and kept under observation for a week or ten days. Have the animal examined by a competant physician or veterinary surgeon, and if the animal is rabid the characteristic symptoms will soon be observed. Pasteur says, the animals will certainly die within eight days. If at the end of that time no symptoms of rabies have been observed the bite cannot cause hydrophobia, and there is no reason why the animal should be destroyed. If symptoms of rabies do appear in the animal thus under observation, it should be immediately killed. And, if the animal has bitten a human being, a small portion of the medulla oblongata should be secured and placed in a small vial containing pure glycerine only, for use in experimental inoculations of other animals to determine without doubt whether the animal suspected of rage was really rabid. If other animals have been bitten by a suspicious animal they should likewise be confined until it is proven whether or not they are rabid, or until the period of incubation has passed. It is quite frequently the case that valuable stock has been bitten by animals not rabid, and it would be a useless destruction of property to destroy such animals. Do not kill an animal unless you have good reason to believe it is rabid, or unless it is a source of danger to other animals and to human life. Of course a dog may run mad when it is quite impossible to secure the dog, and extremely dangerous for it to run at large, where shooting the animal may be the only safe way. In such a case the animal should not be disposed of until it is absolutely certain that no person has been bitten. If a person has been bitten a portion of the madulla should be prepared as described above. If a human being has been bitten and the animal is destroyed there is no way left to ascertain whether or not the dog was really mad, and whether the person bitten has been inoculated with the virus of this terrible disease.

If precautions as above outlined are taken we do not think any unusual apprehension need to be felt in regard to rabies.

GLANDERS.

As in former reports we again state that substantially the only contagious disease affecting the horse that claims the attention of this Commission is glanders in its different developments. Also as formerly stated this vile disease is but mildly contagious, but in practice is absolutely incurable. Somewhat extensive observations by the writer leads to the absolute conviction that man himself is quite as susceptible to inoculation and communication of this loathsome disease as is the equine species given the same opportunity of exposure. The practice of extermination of all equine animals found affected with glanders in any form, which has been pursued by this Commission for years, has been productive of results of a highly satisfactory character. It is true that occasional reports of outbreaks of this disease reaches this Commission, and in some cases several animals are found affected in a limited area: a careful investigation, however, almost invariably shows that the outbreak is traceable to an animal recently brought from without the State, the diseased brute being affected perhaps in a chronic form, hence not so easily discovered. Barring occasional outbreaks as before referred to from importations from other states the practical suppression of this disease within our State is assured. Every case of glanders appearing in the State should be immediately destroyed, or should the owner refuse to do this, they should be rigidly quarantined by the local authorities and the matter promptly reported to some member of this Commission.

ACTINOMYCOSIS.

A decade ago actinomycosis, or lumpy jaw, was exceedingly common in several counties of this State and caused considerable loss to cattle-growers in some localities.

At that period a series of experiments were carried on at the experiment station under the direction of this Commission to learn more about the communicability of the disease. But little was learned from the experiments. In fact, it may be said the results were negative. The disease appeared in a sporadic manner but spread in certain localities with considerable rapidity. It was apparently epidemic or epizootic in the localities referred to. However, it rapidly ran its course and ceased its extensive depredations as mysteriously as it came. From that date to the present isolated cases are appearing in different portions of the State, not attended with serious loss in any locality. The disease when treated in its early stages seems to respond favorably in a large majority of the cases.

The Bureau of Animal Industry in behalf of the general government have carried on very extensive experiments for its cure. The manner and mode of treatment are fully set forth in bulletin No. 2, United States Department of Agriculture, Bureau of Animal Industry, from which we quote:

Treatment.—"The medicine used by the Bureau of Animal Industry in the treatment of actinomycosis, or lumpy jaw, is the iodide of potassium. The dose should never exceed one-quarter dram for every 100 pounds live weight. The proper dose being from two to three drams, according to the size of the animal and the extent of the disease. This dose may be given once a day for from five to six days, when the animal may show slight symptoms or iodism, viz.: Discharge of thick mucus from the nose and flowing of tears. The animal will become constipated perhaps, but this may be easily remedied by giving a dose of glauber salts and some bran mash. This will restore the appetite, and two days after the last dose was given the animal be ready for another week's treatment, and so on until a cure is effected. If these precautions are taken no ill effect will result from the treatment, and if properly fed the animal will gain in condition uninfluenced by the medicine. There is, however, a great difference as to the effect of the medicine on different animals, but any farmer who takes an interest in seeing his stock do well will easily perceive when it is best for him to stop and give the animal a rest for two or three days. The medicine is best given dissolved in soft water and given by means of a horn or long necked bottle. One dose of the medicine, say one and one-half to two or three drams, as the case may seem to require, is dissolved in about a pint of water, seize the animal by the nose to hold up the head, and the contents of the bottle is emptied into the mouth without fixing or securing the tongue in any way."

The medicine is not expensive and can be procured at any drug store, and if the farmer has not suitable scales it can be put up in desired doses by the druggist. A large per cent of the cases treated with this remedy have been reported cured, and the treatment is well worthy of a trial. Our observation with the many cattle we have had under our charge in this State leads us to conclude that many cases may be cured in the early stage of development by the use of the knife.

TUBERCULOSIS.

.The subject of tuberculosis, a disease to which the bovine is highly susceptible, is not so easily disposed of. If this disease is to be dealt with in a manner looking to its suppression, additional legislation will be highly essential. This legislation should contemplate remuneration to owners of infected cattle. It should contemplate the proper manner of carrying along breeding animals to protect the young from infection. It should contemplate the inspection of meat of slaughtered animals showing slight lesions of the disease with a view of utilizing such of it as proved to be wholesome. What is known as the tuberculin test as a diagnostic agent in this particular disease is truly wonderful in its accuracy in determining all or nearly all of the infected animals, only occasionally failing to react in case of an animal having lesions of the disease, and seldom reacting in case of an animal not affected. However, it makes no sort of determination of the degree to which an animal is affected. You may have two perfectly typical reactions, or two dozen, if you please, quite as typical. The post mortem will or may disclose that each and every one of these cattle were affected, but you will find all stages or degrees of infection. You will find an animal with its glandular and pulmonary systems terribly, desperately affected. Evidently the diseased brute is daily, probably hourly, throwing off broken up nests of the tubercle bacilli to infect its associates and perhaps even man himself. On the other hand, you will find another animal in the same lot with an equally typical reaction that is fine and sleek and in physical appearance in perfect health. Post mortem may determine that the animal is affected with the disease. But how affected? You may find upon the closest scientific examination that the entire affectation may be a slight lesion of a small gland or two, and the ordinary every day man of affairs has a perfect right to conclude, as the writer concludes, that this animal as far as tuberculosis was concerned, had it been removed from further infection except what it had already imbibed, might have lived for a long and useful career and finally died of old age.

DISEASES OF SHEEP.

Since issuing the last biennial report this Commission have perhaps responded to more calls from flock masters than in the whole previous history of the Commission. Nearly every case of fatality has proven on careful examination to have been caused by internal parasites. Parasites are living animal organisms that extract nourishment for their existence from the tissues of their host. In sheep we find that parasites are the cause of many of the most serious diseases. They invade all the organs of the body from the brain to the rectum, their multiplication and resultant damage being in direct proportion to the neglect and bad management on the part of the flock owner. Of all the numerous internal parasites we have to contend with the twisted stomach worm (strongylus contortus) is perhaps the most prevalent and responsible for the most fatalities. The strongylus contortus inhabits the fourth stomach of sheep, and while it does not cause any great disturbance, usually among the adult sheep, I think I am safe in saying that it has been the cause of more financial loss to farmers and flock owners of Michigan during the summer of 1900 in its fatalities among the lambs than all other diseases of the sheep combined. These parasites may be found adhering by their heads to the mucous membrane of the stomach. They are of a reddish color and feed principally, we are told, upon the blood of the animal. These little worms when present in large numbers ofttimes appear like masses of threads from one to one and one-half inches in length. If the animal has been killed for examination the worms may be seen wriggling and squirming in all directions, and the writer has even found them in balls as large as a hen's egg. Their presence in large numbers causes great weakness, considerable fever and ofttimes aggravated diarrhea. A dropsical swelling under the chin will usually be seen; the eyes, lips and tongue are very pale; the animal loses appetite, mopes around and is always thirsty, consuming large quantities of water, if able to get it, and contrary to the usual nature of sheep seem almost to prefer to drink from some filthy pool rather than a clean trough. The blood becomes pale and watery. The parasites develop somewhat slowly and their presence may not be discovered by the indifferent flock master until one or more fatalities have occurred. If you have done nothing until this occurs your losses will be large. Treatment of this disease has so far not been very successful. The gasoline and milk treatment being perhaps as good as anything yet tried. Immunity from severe losses with this disease must then be by prevention. It is the opinion of the writer of this part of the report (the Secretary of the Commission, who is the owner of a flock of pure bred sheep), based upon several years of actual experience, that when our flock owners shall have awakened to the absolute necessity of taking early preventative measures that their losses may be reduced to a minimum. This should commence as soon as the lamb begins to eat. I am satisfied that the time honored biblical phrase "they that are well need no physician" is not applicable to this case, for in 95 per cent of the cases of strongylus contortus in lambs "they that are sick" need only the undertaker. We have not found this disease particularly prevalent in one locality, but we have found it creating sad havoc among the lambs in almost every county in the State where sheep are kept. In this connection I wish to say a word regarding the resent

ANTHRAX SCARE.

In July, 1899, this Commission received a report from Washtenaw county that adult sheep were dying upon a certain farm from what was believed to be some contagious disease. The case was investigated by the State Veterinarian and diagnosed as internal parasites and treatment recommended. Some days later the startling report was in the newspapers that some Grand Rapids parties had discovered that anthrax existed on this farm and was the cause of the death of those sheep. Full of forebodings two members of this Commission together with the State Veterinarian proceeded immediately to the farm. The second visit was about two weeks later than the first. Dr. Dunphy proceeded to hold a very careful post mortem on a sheep that had recently died, and stated positively that there was not even the symptoms of anthrax. The Commission were greatly relieved. As the reports continued to circulate that anthrax did exist there Dr. Dunphy a few days later asked and obtained the consent of the Commission to take a bacteriologist from the University of Michigan to the place, and in this way set at rest the question that we did or did not have anthrax. After holding a post mortem and making careful observations, the gentleman from the university stated most emphatically that there was no anthrax there. Following not too closely upon this, reports were circulated from time to time, always emanating we believe from the same source, that anthrax existed in certain herds of cattle. First from Lake county, then Kent, then here, then there, until this Commission began to think that anthrax must be "omnipresent everywhere." These earlier reports were all investigated by the State Veterinarian, in none of which could he find a vestage of a symptom of the dread disease. Specimens were sent from time to time by those who seemed to be interested in establishing the fact that anthrax did exist as well as by those who believed it did not exist in our State to the Bureau of Animal Industry at Washington, to Dr. Baker, Secretary of the State Board of Health, and to the bacteriologist at the experiment station, and in no case could these unbiased gentlemen, who certainly have the welfare of our live stock industries at heart, find traces of this disease. To set the matter at rest for all time the secretary of this Commission recently wrote to Dr. D. E. Salmon, Chief of the Bureau of Animal Industry at Washington, asking for his opinion regarding this matter, as it was a question of vital importance to the stock raisers at large. I shall take the liberty of herewith incorporating a copy of Dr. Salmon's reply, which needs no farther comment in this report:

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY,
Washington, D. C., December 26, 1900.

MR. C. A. TYLER, *Secretary, State Live Stock Sanitary Commission, Nottawa, Mich.:*

Dear Sir.—Replying to your letter of the 21st instant, so far as my observations go I have found Dr. Dunphy a conservative and well informed veterinarian. He has certainly acted for the best interests of your State in using his influence to counteract the anthrax scare. There were specimens sent to the laboratory of this bureau from alleged anthrax cases, which were carefully investigated and which were found to be free from any anthrax contagion. I do not say that no case of anthrax has occurred in Michigan, as it would be easy to produce such a case by inoculation if it could not be obtained otherwise. I do know however that the early cases which were supposed to furnish material for the diagnosis of anthrax, and from which specimens were sent here, were not cases of that disease. I think Dr. Dunphy showed his good judgment by refusing to recognize them as such. I should be sorry to learn that Dr. Dunphy had been injured in any way by adhering to a correct diagnosis. Very truly yours,

D. E. SALMON,
Chief of Bureau.

We feel safe to say that up to the present time no case of anthrax has been reported to or come under the observation of the State Veterinarian.

FOOT-ROT.

Since the last biennial report no cases of foot-rot have been reported to this commission, and while this is not proof positive that no case now exists in the State, we are of the opinion that no serious outbreaks have occurred. The methods of treatment and the entire elimination of this disease from a flock that may have contracted the disease is now so well known, that we do not apprehend that the flock-masters of Michigan need have any uneasiness regarding it.

SCAB.

Scab has only been reported to the Commission from one township, and while we are of the opinion that there has been other outbreaks than this the sheep owners have been so fully alive to the necessity of handling it rapidly, thoroughly and well, that it has not been the cause of serious difficulty. We do not think the native sheep of Michigan are affected with this disagreeable malady, and where it has been found, it has come to us with western sheep that have been brought in for feeding or other purposes. While this disease if left to run its course will cause serious losses, it is not difficult to eradicate. Dipping, dipping, dipping, thorough dipping is the remedy. We would advise very strongly against the use of lime and sulphur dip, as the almost universal testimony of the best sheep men and wool buyers and manufacturers, as well as the personal experience of the writer of this article, is that it is positively very injurious not only to the wool but to the sheep as well. That it will cure scab if used thoroughly enough and hot enough, we do not deny, but that it will also kill the life of the wool, and seriously injure at least fifty per cent of the sheep so dipped, is equally true. There are dozens of good proprietary dips that are fully as efficacious in the curing of scab, and can be used without the attendant risks. The question of cost cuts comparatively no figure with the small Michigan flocks, as the expense for material with any good standard dip is not more than a cent or two per head at most, if dipped with the wool off. Happy is the flock owner wno has not yet made the acquaintance of sheep scab, but that he may readily recognize it if it should by chance misfortune invade his flock, we here append a clipping from Bulletin No. 21, U. S. Department of Agriculture, a careful reading of which will make the discovery and diagnosing of the disease a comparatively easy matter, and give the flock master, we hope, as intimate an acquaintance with his majesty, "Psoroptes communis" as he may ever be called upon to make.

To recapitulate let us say, the only serious diseases of sheep that are confronting the flock owners of Michigan are foot-rot, scab and internal parasitic diseases. Foot-rot is now under control. Scab when appearing may be readily and effectually stamped out. But for the dreaded internal parasites that have caused such serious losses to our flock owners during the summer months of 1900, until such time as the science of materia medica shall have given us a more efficacious remedy than those we have yet tried, we must wage a continual warfare of prevention if we would save our flocks from its ravages.

DESCRIPTION OF SHEEP SCAB.

COMMON SCAB, BODY SCAB OR PSOROPTIC SCAB.

Although the symptoms of common scab are familiar to most farmers, they will here be briefly reviewed.

The mites of common, or body, scab—that is, the Psoroptes—prick the skin of the animal to obtain their food, and probably insert a poisonous saliva in the wound. Their bites are followed by intense itching, with irritation, formation of papules, inflammation, exudation of serum, and the formation of crusts, or scabs, under and near the edge of which the parasites live. As the parasites multiply they seek the more healthy parts, spreading from the edges of the scab already formed, thus extending the disease. The sheep are restless; they scratch and bite themselves, and rub against posts, fences, stones, or against other members of the flock. This irritation is particularly noticeable after the animals have been driven, for the itching is more intense when the sheep become heated. The changes in the skin naturally result in a falling of the wool; at first slender "tags" are noticed; the fleece assumes the condition known as "flowering;" it looks tufty or matted, and the sheep pulls out portions with its mouth, or leaves tags on the objects against which it rubs. Scabs fall and are replaced by thicker and more adherent crusts. The skin finally becomes more or less bare, parchment-like, greatly thickened, furrowed and bleeding in the cracks. With shorn sheep especially, a thick, dry, parchment-like crust covers the greatly tumified skin. Ewes may abort or bear weak lambs.

Parts of Body Affected.—When sheep are kept in large numbers the chances for infection are naturally greater, and the disease may begin on almost any part of the body. Generally, however, it affects the parts which are covered with wool. When the sheep are fat and the wool has a large amount of yolk, the progress of the disease may be slow; usually beginning on the upper part of the body, withers and back, it extends slowly, but none the less surely and in ever-increasing areas, to the neck, sides, flanks, rump, etc. In two or three months the entire body may be affected.

Contagion.—Common scab is exceedingly contagious from one sheep to another, and may in some cases show itself within about a week after healthy sheep have been exposed to infection. The contagion may be direct, by contact of one sheep with another; or indirect, from tags of wool, or from fences, posts, etc., against which scabby sheep have rubbed, or from the places where the sheep have been "bedded down." One attack of scab does not protect sheep from later attacks.

Chances for Recovery.—Cases of apparent spontaneous recovery are rare. Usually when proper methods of treatment are not adopted the disease increases, leads to anæmia, emaciation, exhaustion and death, and may result in a loss of from 10 to 80 per cent of the flock. Scab is favored by seasons when the wool is longest, and by huddling or overcrowding the animals; also race, energy, temperament, age, state of health, length, fineness and abundance of wool, and the hygienic conditions of the surroundings influence the course and termination of the disease. Young, weak, closely inbred animals, and those with long, coarse wool will most quickly succumb. Unhealthy localities, damp climate and poorly ventilated sheds favor the disease. Pure or mixed Merino sheep succumb sooner than certain other breeds. The mortality varies according to conditions, but is highest in autumn and winter. When owners are careless the death rate may be very high; if untreated the sheep may die in two or three months. Hygienic conditions, good food and cool dry atmosphere tend to check the disease. Sheep sheds should accordingly be well ventilated and open to light and sunshine. With proper attention to hygienic conditions and thorough dipping, a positive cure can be guaranteed.

Vitality of the Parasite.—Taken from the sheep, the mites possess a remarkable vitality. It is generallly stated that, kept at a moderate temperature on portions of scab; the adults may live from four to twenty days, but they will occasionally live much longer; cases are on record where they have lived three, four, or even six weeks when separated from sheep; if the atmosphere is dry they will generally die in about fifteen days; but death is often only apparent, for the mites may sometimes be revived by warmth and moisture even after six or eight weeks; the fecundated females are especially tenacious of life. Various rather contradictory statements may be found regarding their resistance to cold. Krogman states that they may live at a temperature of minus 10° C. (+14° F.) for twenty-eight days. Other authors claim that the mites die in two hours at 47° F.; still other authors, that they die at 50° C. (122° F.) They are said to have been kept alive in cold water for six days and in warm water for ten days. Several authors admit, however, that the parasites are usually killed by a soaking rain; though it is claimed that in damp, dark stables they "may live for months."

Experience has shown that in some cases apparently healthy sheep have become infected in places where no sheep have been kept for four, eight, twelve or even twenty-four months. The conditions underlying this infection are not thoroughly understood. Possibly some of the eggs have retained their vitality a long time and then hatched out; possibly the vitality of the fecundated female has also played a role; while it is not at all improbable that an entirely new infection has accidentally been introduced by birds or other animals. Certain authors of high standing scout the idea that birds can introduce an infection of scab, but there is no reason why birds should not do this, and there are some reasons for believing that they do. It has been noticed on the Experiment Station of the Bureau, for instance, that crows delight in perching on the backs of scabby sheep and picking at the scab. While so doing it is only natural that small tags of wool would adhere to their feet, and thus scatter scab. The fact that snails cling to birds' feet and are carried long distances is too well established to need discussion, and it is very probable that many of the cases where sheep are supposed to have become infected with scab on pastures which have not been occupied for one or two years are in reality cases of fresh infection by means of birds. From the data at hand, while it may be admitted that in some cases, under favorable conditions, the mites may live from spring to fall, it is scarcely within the limits of probability that either the scab mites or their eggs will live through a winter when separated from the sheep and exposed to the elements.

All matters connected with the vitality of the scab mite have an important bearing in explaining cases of indirect infection on roads over which scabby sheep have been driven, or in fields and sheds where they have been kept. From the facts now at our disposal we can lay down the following important rules:

(1) Scabby sheep should never be driven upon a public road; (2) sheds in which scabby sheep have been kept should be thoroughly cleaned, disinfected and aired, and should be left unused for *at least four weeks* (better two months) before clean sheep are placed in them; (3) fields in which scabby sheep have been kept should stand vacant *at least four weeks* (better six or eight) before being used for clean sheep: (4) a drenching rain will frequently serve to disinfect a pasture, but it is well to whitewash the posts against which scabby sheep have rubbed. Even after observing the precautions here given it is not possible to absolutely guarantee that there will be no reinfection, but the probabilities are against it.

Life History of the Parasite.—A study of the life history of the scab parasite is necessary in order to determine several important points of practical value, such as the proper time for the second dipping, etc.

The female mite lays about 15 to 24 eggs on the skin, or fastened to the wool near the skin; a six-legged larva is hatched; these larvæ cast their skin and become mature; the mites pair and the females lay their eggs, after which they die. The exact number of days required for each stage varies somewhat, according to the writings of different authors, a fact which is probably to be explained by individual variation, and by the conditions under which the observations and experiments were made. Thus Gerlach, in his well-known work (1857), estimates about fourteen to fifteen days as the period required for a generation of mites from the time of pairing to the maturity of the next generation. He divides this time as follows: Under ordinary conditions the eggs hatch in three to four days, although two authors allow ten to eleven days for the egg stage; three or four days after birth the six-legged larvæ moult and the fourth pair of legs appears; this fourth pair is always present when the mites are two-thirds the size of the adult; when seven to eight days old the mites are mature and ready to pair; several (three or four) days are allowed for pairing; another generation of eggs may be laid fourteen to fifteen days after the laying of the first generation of eggs. Without going into all of the other observations on these points, it may be remarked that the eggs may not hatch for six or seven days; the six-legged larvæ may moult when three to four days old, and become mature; after pairing a second moult takes place, lasting four to five days; a third moult follows immediately, then eggs are laid and the adults die; in some cases there is a fourth moult, but apparently without any further production of eggs. Accepting Gerlach's estimate of fifteen days as an average for each generation of ten females and five males, in three months' time the sixth generation would appear and consist of about 1,000,000 females and 500,000 males.

Several practical lessons are to be drawn from these figures: First, it is seen that the parasites increase very rapidly, so that if scab is discovered in a flock, the diseased sheep should immediately be isolated; second, if new sheep are placed in a flock, they should either first be dipped, as a precautionary measure, or they should at least be kept separate for several weeks to see whether scab develops; third, since the chances for infection are very great, the entire flock should be treated, even in case scab is found only in one or two animals; fourth, as dipping is not certain to kill the eggs, the sheep should be dipped a second time, the time being selected between the moment of the hatching of eggs and the moment the next generation of eggs is laid. As eggs may hatch between three and seven (possibly ten or eleven) days, and as fourteen to fifteen days are required for the entire cycle, the second dipping should take place after the seventh day, but before the fourteenth day; allowing for individual variation and variation of conditions, the tenth, eleventh or twelfth day will be the best time to repeat the dipping.

IMPORTANCE OF PROPER USE OF DIP.

Whatever dip is selected, the farmer should not forget that there are two ways to use that dip. One way is to prepare and use it in accordancee with the directions given: the other way is to attempt to economize time, labor, or money by using the dip in weaker proportion than advised, by hurrying the sheep through the swim, or by later placing the dipped sheep under unfavorable conditions. If the former method is adopted with any of the established dips, the treatment ought to be followed with favorable results; but if the latter method is adopted, the farmer himself must assume the responsibility of failure, no matter which dip he decides to use. Every farmer should therefore remember that when he has decided upon the dip he is to use his work is only begun; to use the dip properly is fully as important as to use a dip at all.

The Pastures.—In case it is necessary to place the dipped sheep on the same pastures they occupied before being dipped, it is always best to use a dip containing sulphur. If a proprietary dip is selected under those circumstances, it is suggested that sulphur be added, about 1 pound of flowers of sulphur to every 6 gallons of dip. In case it is possible to utilize fresh pastures after dipping, the use of sulphur is not so necessary, but is always advisable. The object in using sulphur is to place in the wool a material which will not evaporate quickly, but will remain there for a longer period of time than scab parasites ordinarily remain alive away from their hosts. By doing this the sheep are protected against reinfection.

SWINE PLAGUE AND HOG CHOLERA.

The ravages of these two forms of swine disease in many of the counties of Michigan, each season, have invariably caused greater losses to the farmers of the State than all other diseases combined. The State Live Stock Sanitary Commission has responded to calls from farmers, and local health officers, and, whenever possible, the Commission, or a member thereof, has personally visited the infected districts and endeavored to assist the farmers in fighting this terribly destructive disease and reducing its fearful ravages.

The United States Bureau of Animal Industry is constantly employing scientific experts to experiment with and investigate every form of treatment and inoculation of swine to cure swine plague and hog cholera, but with very unsatisfactory results.

PREVENTION FAR BETTER THAN A CURE.

It is during the hot summer and fall months that these swine diseases ravage so many townships in some of the southern counties of the State. When an outbreak occurs the farmer is usually willing to adopt almost any stringent or heroic measures to save his swine. When we consider the actual sanitary conditions surrounding thousands of hog yards, pens, sleeping places, feeding troughs, etc., it is a wonder that so many hogs survive the ordeal during these hot months. Thousands of hogs never receive any fresh cool water during weeks of hot weather, when they should have an abundance daily.

CAUSES OF HOG CHOLERA AND SWINE PLAGUE.

As was stated in the last report of the Commission, the result of past experiments show that the germs of hog cholera find their way into the bodies of swine with the food and drink, by infection, through sores and flesh wounds, and by inspired air; while those of swine plague are taken almost entirely with the air and through the lungs. Hog cholera germs are very hardy and vigorous. They are able to live for a long time and multiply in the water of ponds and streams. They may live in the soil for at least three months, and in accumulations of straw and litter for a much longer time. They withstand drying and other adverse conditions in a remarkable manner, and will survive in a frozen state for two or three months. The two diseases are sometimes found doing their destructive work together.

CAUSE OF OUTBREAK.

In every instance where definite information could be obtained, outbreaks of hog cholera, or contagious diseases among swine, have been traced to the importation of swine from other states or from infected districts in this State, or from railroads transporting diseased animals. When the germ is once planted and the disease makes its appearance in a herd, its spread to other herds in the vicinity can only be prevented by exercising and enforcing the most careful and rigid measures. The disease may be carried from herd to herd, and from farm to farm, not only by "flesh devouring animals, birds and insects," but by water courses, through drain tile, heavy showers washing under fences and across enclosures, and on the wheels of vehicles and feet of persons and animals.

SYMPTOMS.

The symptoms of hog cholera are so varied, according to conditions of the disease, that it would be almost impossible to give a description that would positively identify the disease in every instance. Therefore it would be well for every farmer, when he notices anything unusual in his swine, such as loss of appetite, diarrhea, or dullness and indisposition to come to the feed trough, or leave their sleeping quarters, to take the precautions necessary to control an outbreak of hog cholera.

SUGGESTIONS AND PRECAUTIONS.

If the farmers of Michigan who raise swine can be induced to generally adopt better sanitary precautions and improve the environments of their swine yards and pens, especially during the summer months, we are confident that the annual losses from swine plague and hog cholera may be ultimately reduced to a minimum each season, and save many thousands of dollars that are annually lost to Michigan swine raisers.

The best plan is to prevent an outbreak if possible, even though the disease is ravaging in the neighborhood. First, weed out all "runts," leaving only well developed pigs in the herd. Frequently clean out all pens, yards, sleeping places and troughs. If you have an old swill barrel or tub that has stood over from last season knock it to pieces and burn it. It is too true that the average swill barrel stands in "a hole in the ground" for several seasons without a single thorough cleaning or disinfection.

Frequently clean out and disinfect with plenty of fresh lime in solution of one-half pound of lime to one gallon of water. From one to two ounces of crude carbolic acid may be added. Use a sprinkling can or spray pump and thoroughly saturate all places liable to be infected.

Furnish plenty of pure fresh water every day to each animal from now until late in the fall. See that plenty of shade is available during hot weather. Feed liberally and make each pig grow every day from birth. Furnish charcoal, salt, ashes, burnt cobs, either singly or in combination. The government formula is as follows:

Wood charcoal	1	pound.
Sulphur	1	"
Sodium sulphate	1	".
Antimony sulphide	1	"
Sodium bicarbonate	2	pounds.
Sodium chloride	2	"
Sodium hyposulphite	2	"

These ingredients should be completely pulverized and thoroughly mixed.

Dose, one large tablespoonful of the mixture once a day for each 200 pounds weight of the hogs to be treated. The medicine should be given in soft feed, as corn meal or ground oats, or crushed wheat, mixed with bran or middlings well moistened with hot water.

A well developed pig, with a strong constitution, is far better able to resist the attack and evasion of swine plague germs, than is the pig that has a weakened constitution, and is forced to live, eat and drink in filthy, germ-laden quarters, with no shade or fresh water furnished daily. Under such conditions, the "survival of the fittest" frequently leaves nothing but the hog pen after the scourge is over.

Every swine owner should keep sharp watch, and, whenever the disease appears, remove the healthy swine from the pen where the outbreak occurs. Do this every time, putting the healthy hogs into new, clean and dry quarters, well disinfected. Never remove sick pigs from a pen, leaving a healthy one instead, to in turn become infected. Keep the two lots of pigs entirely separated, so that no animal or vehicle can pass from one pen to the other.

One important fact to be borne in mind is the fruitful source of the spread of contagion by the visit of one neighbor to another in order to view the sick swine. No owner of swine should take any chances of infecting his herd in this manner. Whenever it is necessary to enter the enclosure of the sick animals it would be well to put on rubbers, and cleanse and disinfect them before coming in contact with any healthy swine or their feeding places. Another factor in the spread of the disease is the prowling about of dogs, digging up and eating portions of the dead animals, consequently all dogs in the neighborhood, where hog cholera exists, should be kept tied up and not allowed to roam at large. All dead animals should be immediately burned or buried deeply. Very sick pigs had better be destroyed at once. When the disease appears, heroic measures must be resorted to at once by the swine owner, and he should immediately notify the supervisor of the township, and a member of the State Live Stock Sanitary Commission.

TO SUPERVISORS.

Whenever you hear of an outbreak of swine plague or hog cholera in your township, you should proceed at once to investigate, and should such investigations show that an animal is affected you should notify all owners of swine in the neighborhood, and your local board of health should order a rigid quarantine of each and every affected herd. You should also notify a member of this Commission of the outbreak, location, and the action taken by you. The Commission will assist—by personal visit, if necessary—and take such action as the case may require to prevent further spread of the contagion.

HENRY H. HINDS,
COMFORT A. TYLER.

Lansing, Mich., May 1, 1901.

REPORT OF STATE VETERINARIAN.

Hon. H. H. Hinds, President of Live Stock Sanitary Commission:

Sir—I herewith beg leave to submit the eighth biennial report of the State Veterinarian for the years 1899 and 1900.

Since submitting my last report I have visited almost every part of the State on account of alleged outbreaks of contagious diseases among live stock, some of which have proved of a serious nature, owing to the fact that communicable diseases have been found affecting herds, the milk of which had been sold for public consumption. Owing to the fact that certain contagious diseases of the lower animals are communicable to mankind, and the interest awakened in this matter among State and local health boards, the attention of the Live Stock Sanitary Commission and State Veterinarian have been called to very many cases that in past years might have been overlooked.

In the progress of sanitary science discoveries have been made and demonstrated by indisputable experiments, tending to show that in order to preserve the health of the people of the State a great deal of attention must be given to our meat and milk supply. The work of your honorable Commission has been two-fold in its services; first, by its efforts to restrain and stamp out contagious diseases among our live stock, thus preserving the wealth of the State; second, and of more vital importance, protecting the health of our people, by destroying or rigidly quarantining those animals affected with such diseases as are communicable to man.

It is not my purpose to make this report in the form of a treatise on contagious diseases, but will mention some of the diseases with which I have come in contact in attending to my duties as State Veterinarian.

DISEASES OF HORSES.

Among horses glanders has been the principal contagious disease to which my attention has been called. Glanders may be defined to be a contagious constitutional disease of the genus equus (the horse, ass and mule), readily communicable to man, sheep, dogs, cats, the rabbit, and guinea pig. It runs a variable course until it causes the death of the animal affected with it.

It is accompanied with a variable amount of fever according to the rapidity of its course. It is subject to various complications of the lymphatic glands, of the lungs, of the internal organs and of the subcutaneous connective tissue.

In order to understand the different lesions that may be found in a stable where several animals are affected, it must be understood that glanders and farcy are one and the same disease, differing only in that the term glanders is applied when the disease is shown in the lungs and air passages, accompanied by a discharge from one or both nostrils, and that the term farcy is applied when the principal lesions are shown in the skin and the superficial lymphatic glands. This disease is found frequently in the most insidious forms, and I believe it can exist without being apparent, that is, it may affect a horse for a long period without showing symptoms that will enable the most experienced veterinarian to make a positive diagnosis. Consequently such a diseased animal may spread the disease among its stable companions without being suspected itself, but happily for the protection of the public, a test has been discovered whereby the disease may be identified when no positive symptoms have made their appearance. I refer to the mallien test. A liquid has been prepared from pure cultures of the bacillus mallie, properly sterilized and named mallien, which, when injected into the subcutaneous tissue of the glandered animal, causes a rise of temperature in a few hours and great tumefaction around the point of injection. While in the healthy animal no changes of any importance are noticed.

The symptoms of glanders are many and varied, so much so that it would take up too much of our space to enumerate them, and from the fact that many of these symptoms closely resemble those of other diseases none but the veterinarian should attempt to differentiate between them, as a mistake in diagnosis might lead to the destruction of a harmless and useful animal, or on the other hand, a case of chronic glanders might be overlooked, that would lead to serious results by spreading the disease among other animals or even man himself. Consequently I would advise the horse owner in any case where he has an animal with a discharge from the nostril that has prevailed for several months to call in the veterinarian, and if doubts arise in the mind of the veterinarian, it would be wise to apply the mallien test. Instance after instance has been recorded where a horse affected from chronic glanders in a mild form has escaped the notice of the owner until a number of his stable companions have died from the disease in the acute form. In my own experience within the last few months I condemned a glandered animal where the history of the case showed plainly that the animal had communicated the disease to two of his mates, one having died with the disease, and the other was in a dying condition, when I was called to investigate the case, while the primary source of the disease was still hearty and able to work, although showing undoubted symptoms of chronic glanders.

I wish to emphasize the fact that all glandered animals when destroyed should be burned or buried very deeply in order to keep the carcass out of the reach of dogs, as carnivera are very susceptible to the disease from eating the flesh of a glandered animal. A case is recorded where a pack of wolves in the Philadelphia zoological garden died within ten days after being fed with the meat of a glandered horse.

Owing to the extreme susceptibility of the dog and cat to this disease, and the fact that they are, in many instances, the playmates of the children, the greatest caution should be exercised to put the carcasses of glandered horses well out of their way. Experience with glanders while acting as State Veterinarian has demonstrated to me that eternal vigilance is necessary in the control of this disease, as twenty cases have made their appearance in the last two years, while in the two years preceding only eight came under my notice.

CEREBRO SPINAL MENINGITIS.

This disease although not contagious in its nature occasionally makes its appearance in a manner such as to lead the owner of the horses to believe that he has a contagious disease to contend with.

Two such outbreaks have occurred within the last year where several valuable horses have died on the same farm, and the owners in each case notified the Commission that a peculiar contagious disease had broken out among their horses. However, a careful investigation convinced me that the disease came from some local cause. The location of the wells led me to believe that the water was the source of the trouble, and a careful examination of some samples (taken from the well) by the bacteriologist at the experiment station confirmed my suspicions. The well was adjacent to the barn and was so placed that the drainage from the stables and barnyard would naturally drain into it. In fact the water plainly showed the discolorations from this drainage. Experience has taught the veterinarians that contaminated water and other unsanitary conditions are very potent influences in producing this disease. Still its ultimate cause has not yet been demonstrated, and complete preventive measures cannot be formulated until the bacillus or microorganism, if one exists, is known and its life history defined. In these cases the Commission and State Veterinarian need the assistance of the bacteriologist, for not until the primary cause of a disease is discovered and verified can we undertake to effect its control in an intelligent manner. In both these cases after a thorough cleaning out of the wells and putting them in a sanitary condition and preventing the surface water from draining into them no more cases have developed.

DISEASES OF CATTLE.

Among cattle the principal diseases to which my attention has been called were tuberculosis, actinomycosis, symtomatic anthrax, or black quarter and contagious or infectious ophthalmia.

TUBERCULOSIS.

Owing to the intense interest manifested by boards of health in regard to this disease in man, and the generally admitted theory that the disease is communicable from animal to mankind, tuberculosis will no doubt engage the attention of the Commission to a greater extent from year to year as the public become more enlightened in regard to its contagious nature.

The stock owner will consider it from an economic standpoint, while the physician and many of the laymen that are purchasers of meat and milk will look upon it from its sanitary and moral bearing. Although the fact of its contagious nature seems to be established beyond controversy, and are accepted by all who have studied the subject, they are still not as generally appreciated as they should be. This need not surprise those of us who recall the fact that only a short time has elapsed since the tubercle bacillus was discovered, and the contagious nature of the disease established. Still more recently has the identity of human and bovine tuberculosis been demonstrated by extensive experiments by the most eminent scientists on this continent and in Europe. And when we recall the further fact that most of our knowledge of the prevalence of tuberculosis in the State has been obtained through the tuberculin test, and that this most reliable diagnostic agent has been used in our State less than a decade, it does not appear so very strange that the public does not fully appreciate those facts that were unknown to the scientists only a few short years ago.

It would seem from these clearly established facts that a twofold problem confronted your honorable Commission. First, tuberculosis in meat producing and dairy cattle constitutes a menace to public health, and, secondly, the cattle industry suffers in proportion to the extent of the prevalence of the disease. It would appear at the first glance that the duties of the Commission were in connection with the second part of this problem, as at the time the live stock sanitary law was enacted the public were not aware of the communicability of this disease, either from animal to animal, or from the lower animals to mankind. Consequently as our light on this important subject increases it seems that our duties and responsibilities should expand, thus keeping pace with the progress of science, and in such event the great sanitary and moral side of the problem must ever be foremost in our minds, and guide our actions in our efforts to control this insidious and destructive disease.

One very important feature in our efforts to control or suppress tuberculosis is to endeavor to educate public opinion up to a proper appreciation of the advantages of having the cattle of our State comparatively free from this disease. It seems hard in some instances to convince the stock owner that 45 animals that have been declared free from the disease by the tuberculin test are of more value than 50 animals with suspicion of tuberculosis being among them. Live stock sanitary commissions have had much to contend with in regard to this disease, owing to the very radical positions taken by the contending parties, for and against the tuberculin test.

There appears to be a demand on the part of health boards and people in cities that their meat and milk should be protected from contamination with tubercle bacilli. Active controversies seem to have been going on for some time past between the consumers of meat and milk represented by the daily papers, and some of the more progressive sanitarians on one side, and the producers represented by the agricultural press on the other. On one hand the dangers from tuberculous meat and milk were set forth, and in some cases exaggerated by over-enthusiasm, while on the other hand they were minimized to a dangerous and almost criminal degree. I have read within the last year articles in some of the leading live stock papers setting forth the dangers emanating from the application of the tuberculin test, such as abortion, impairment of lacteal secretions, loss of condition and other imaginary evils, all tending to throw discredit on the test.

I need not state to your honorable Commission that such statements are not based upon facts, as the many tests I have made under your jurisdiction and in your presence have shown such statements to be untrue and misleading to the public. Some of these papers seem to have a fondness for publishing unsubstantiated reports of alleged instances in which many healthy cattle were condemned and killed, and other items calculated to discourage any efforts to repress or control tuberculosis in cattle.

I believe that conservative measures, keeping pace with, or following in the wake of public enlightenment on this subject, will be an effective means of eradicating this disease from the State. We have only a small percentage of cattle affected in the State, and I am of the opinion that the percentage is being reduced to a considerable extent within the last three years. I know that it has almost disappeared from our State herds, and although a greater number of herds have been tested in the last year than in any of the preceding years we have had less reactions. There seems to be a disposition among the owners of cattle to rid themselves of any diseased animals, as we find the great majority of our farmers if they have one or more animals in their herd that seem to be affected with a chronic cough reporting them to the Commission, and appear desirous of having a test made in order that they may stamp out the disease at the outset before the whole herd becomes contaminated.

There is no doubt that a number of cases still exist in the State that will not come to light except by accident unless some compensation is allowed the owners, enough to partially compensate them for their apparent loss, viewing the matter in the light they do from a healthy standpoint. Another important feature in regard to the suppression of tuberculosis is the fact that at present we have no protection against tuberculous animals coming in from other states, consequently there is very little encouragement in endeavoring to repress the disease when we have no way of protecting ourselves against further invasions.

A number of the different states have adopted regulations under which no animals are admitted from outside the state for dairy or breeding purposes without being tested with tuberculin, which wise regulation would have saved our State considerable money and trouble in the past. Since tuberculosis has been practically exterminated among our State herds, and our percentage of tuberculous cattle is reduced to such a low figure, would it not be wise to protect the cattle of our State from further contamination by requiring all dairy and breeding cattle coming into the State to be tested. Fifteen states have already enacted such laws, and in only one has there been any serious objection raised. And in this one instance the trouble was due to the fact that the state contains within its borders one of the largest distributing live stock centers in the world. And some rapacious dealers, who simply look at the dollar in the pocket, without regard to the best interest of the live stock industry of the state or the welfare of its inhabitants, have carried the matter into the courts, and the governor has suspended the operation of this regulation until a decision is rendered by the courts.

ACTINOMYCOSIS.

Actinomycosis or lumpy jaw has been reported from a great many localities in the State, and I regret to have to report an apparent increase of this disease. Whether the increase is due to infection from animal to animal, or to certain atmospheric conditions, which are favorable to the development of the fungus on the different grains or grasses where it is known to originate, I have not been able to determine. However, I am inclined to the latter theory as to its increase in the State.

This diease is due to the actinomyces or ray fungus, a vegetable parasite, which is found on numerous grains and grasses, and is supposed to be taken into the mouth with the food, and by this means becomes inoculated into the mucous membranes, or may pass down the alveola of the teeth,and find a suitable habitat to develop in the jawbone. and produce the well known lesions of actinomycosis. This disease is by no means confined to the jaw, as it is frequently found in the tongue, in the glandular system, in the liver and also in the lungs.

There is no doubt when the disease becomes advanced and an abscess forms there is danger of the affected animal infecting its associates, consequently such animals should be quarantined. Unless the disease is very far advanced, the animal can be successfully treated. In Clinton county alone in the last two years, more than a dozen of these cases have been treated by one veterinarian, and in every case the animal has been saved at a comparatively small expense to the owner.

CONTAGIOUS OPHTHALMIA.

Contagious ophthalmia of cattle has been prevalent in several counties in the State within the last two years, my attention having been called to several localities, where I found the disease in its most malignant form causing considerable anxiety and some loss.

This disease consists in more or less violent inflammation of the delicate membrane lining the eyelids and of the transparent tissue which constitutes the cornea or front of the eye-ball. The inflammation in many cases is so intense that it involves all the structures of the eye and in such cases causes adhesions and total blindness. The disease is undoubtedly caused by some micro-organism, although the germ has not yet been positively identified. There is no doubt, however, that it is highly contagious and whatever the causative agent, it seems to be rapidly transmitted from animal to animal, either by direct contact or by contact with infected fences, or possibly through the air.

The first symptoms resemble the ordinary simple ophthalmia, consisting of swelling of the eyelids and a congested condition of the conjunct tiva, and a flow of tears. In the later stages, a deposit forms between the two coats of the eye, and the cornea becomes white and opaque. The discharge from them becomes more sticky and albuminous. as the disease progresses, and assumes the character of a creamy looking pus. The sunlight seems to have a very painful effect on the eye, and the afflicted animals suffer very much to all appearance when exposed to the light, and are inclined to seek dark or shady places that are not exposed to the sun's rays.

I have noticed cases where the cornea had ulcerated and perforation resulted, and the whole contents of the front chamber of the eye had run out, and the eye was completely destroyed. Inquiry into the history of these cases showed that the disease varied in different cases from ten days to three weeks, and I am inclined to believe that with rational treatment, a complete recovery would result unless ulceration of the cornea takes place. The progress of the disease should be checked as quickly as possible by the early isolation of the afflicted cattle, and a thorough disinfection of the premises, where they were kept, such as watering troughs or stables if the animals were housed. Animals under treatment should be placed in a darkened stable, and warm water and mild antiseptics and anodynes used. We cannot too strongly condemn the pernicious practice of using such irritants as burned alum or spitting tobacco juice into the eye of the afflicted animals, and I am inclined to believe that some of the disastrous results of the disease in the animals I inspected came from this cruel and filthy treatment.

SYMPTOMATIC ANTHRAX, OR BLACK LEG.

Symtomatic anthrax, black leg or black quarter, as it is termed, has caused but little loss in this State in the last two years, owing to the fact that the owners of cattle on farms where the disease made its appearance, several years ago, have taken the advice of the Commission, and used the preventive vaccination.

One outbreak occurred in Jackson county in August last which quickly destroyed a number of young cattle, and the owner fearing true anthrax immediately reported to your Commission. After a thorough investigation I was well satisfied that it was black leg, and advised the owner to have the remainder of the young animals vaccinated with the black quarter vaccine virus, which advice he immediately followed and no more of the cattle contracted the disease although kept in the same pasture.

Under the instructions and in the presence of the Live Stock Sanitary Commission, in 1898, I tested the value of the preventive inoculation with vaccine virus on two farms in Branch county where black-leg had recently destroyed a number of valuable young animals, and although a large number of susceptible young animals were still exposed to the same chance of contagion, being kept in the same environments and on the same food and water, not a single animal contracted the disease after being vaccinated.

In localities where this disease has made its appearance this wise precaution of preventive vaccination should be applied to all the animals under two years old that have not been previously vaccinated, as the expense is very small in comparison to what the loss might be in case the disease makes its appearance in the herd. Black leg vaccine is now being furnished by the bureau of animal industry to the farmers of the country. The purposes of the department in providing free vaccine are to check the spread of black leg, thus protecting the cattle industry of the entire country and also to obtain accurate reports as to the prevalence of the disease and the loss caused by it.

The information and experience thus acquired can be used to good advantage in developing improved methods for the suppression of the disease. One important factor that will aid in the work of controlling or suppressing black leg is the burning of the carcasses of all animals that die from the disease and all bedding or other material that it comes in contact with. But in all cases where the disease is feared let the value of the preventive vaccination not be lost sight of, as here is certainly a case that demonstrates the truth of the old adage, "An ounce of prevention is worth a pound of cure."

COWPOX.

This is a form of contagious disease of the udder and teats that is usually conveyed from animal to animal by the hands of the milker. It is believed by some writers to be a modified form of the smallpox of man, modified by passing through the system of the lower animals. Chavau and other eminent continental veterinarians maintained that no intimate relation existed between the two diseases, and seem to prove by experiments that such was an undisputable fact. They claim that in every case where inoculations were carried back and forth between the two species smallpox remained smallpox and cowpox, cowpox. But after all these positive experiments they still have to admit that inoculation with the virus of cowpox produces a partial immunity from the most fatal results of smallpox.

Why then are we not pardonable for differing in opinion with these eminent professional men, unless they account in some satisfactory manner for the peculiar phenomena, viz., an artificial inoculation with the virus of one disease will modify the action of a dissimilar disease and render some degree of immunity from its attack.

A circumstance came under my notice within the past year that throws some doubt upon this theory in my own mind. A member of the Commission was notified of a cow owned on a certain farm in St. Joseph county (where two cases of smallpox had occurred during the early spring months) being affected with what the health officer thought might be smallpox. I was called upon to investigate this case and found a well marked case of variola or cowpox, but differing from the ordinary cases in this particular. The vesicles were not confined to the udder and teats and along the lower part of the abdomen as is usually the case, but had extended all over the body leaving deep pits in the skin where the pimples had healed. The animal was described by the immune attendant that had assisted in caring for the sick patients as having a high fever, attended with loss of appetite and other symptoms resembling smallpox in the human being, and the pits on the skin were certainly similar to those resulting from an acute attack of smallpox. I secured some material from some pustules on the udder that were not entirely healed and wrapped it in sterilized muslin and covered them with several thicknesses of tin foil which was also sterilized, so as to render them perfectly free from outside contamination, and sent them to the laboratory of Parke Davis & Co., of Detroit, to be investigated. Experiments by inoculation into other animals developed a mild form of cowpox, showing that we had only an attenuated virus, that increased in strength when carried to the second animal.

The history of this case is as follows: The home was occupied by a widow and her daughter, the son of this lady being away from home was exposed to smallpox, and soon after his arrival at home came down with the disease. He was attended by his sister, who had been vaccinated two years previous and the vaccination had developed in a very acute form. After acting as nurse to her brother through his sickness the daughter was attacked with the disease in the form of varioloid. This young lady had always taken charge of the cow, and during the time that she was acting as nurse to her brother and while in the convalescence stage following her own illness she still continued to milk this cow, and in a short time the cow was attacked with the sickness above described. I am convinced that this disease was carried from the family to the cow, as a thorough inquiry into the history of the case most certainly eliminated every other probable cause of the infection.

This disease in cattle is ushered in by slight fever which is frequently overlooked and the first sign noticed is tenderness of the udder and teats. In a few days there appear little nodules, not larger than peas of a pale red color and gradually enlarge until they become from half an inch to an inch in diameter. The yield of milk decreases from 25 to 50 per cent, and when tested by heating will be found to coagulate slightly. If the eruption forms on the surface of the udder it does not always rise as a blister, but oozes out in the form of a yellowish colored fluid. The vesicles on the teats are generally ruptured by the hand of the milker, and in this manner conveyed to the remainder of the herd.

I do not believe that the milk of animals affected with cowpox should be used or sold for public consumption, as the animals have more or less fever with this disease, and the coagulation of the milk on the slight application of heat shows an abnormal condition of this fluid.

MALIGNANT DYSENTERY IN CALVES.

My attention has been called to an outbreak of dysentery in calves in Kalamazoo county, where a careful study and investigation convinced me that we had a case of diarrhea that was produced by a germ and was infectious in its nature.

It first made its appearance in calves raised on the premises and several died with the disease. It afterwards became a common occurence, and every calf that was bought and brought into the stable became affected with it, many of them dying, and what few recovered were of little value as they seemed to feed badly and had a weak constitution.

This form of diarrhea was treated for years on this continent and in Europe as though it was produced from improper feeding and stabling, and consequently no progress could be made in preventing it. While the disease was being combatted by attention to these points the vital point, that is, the destruction of the germ that was the cause of the disease was not regarded. The germ was recently discovered by Jemson and two European bacteriologists, who proved conclusively by experiments that the germ was the specific cause of the disease. Some observations indicate that under certain conditions the common colon baccilus may be transformed into this organism and by passage through several animals its virulence is constantly increased. In this way they attempt to explain the fact that this disease may occur among calves in a herd without being brought from without.

The premises where such disease occurs should be regarded as infected premises. The disease should be dealt with in all cases as an infectious disease. When it becomes established in a stable the germs enter the mouths of the calves in various ways, from the surface of the udder and teats, from the dust in the bedding of the stall, from licking the partitions and stalls or from anything in the infected stable that the calf touches with its lips or tongue.

The germ of dysentery is said to be capable of living in the stable for a long period, perhaps for several years. One instance has been observed where breeding was abandoned for a year on account of the prevalence of this disease, but when at the expiration of this period calves were again born into the same stable they were affected with the disease the same as though it had had a continuous existence.

Measures for its eradication in a stable that has become infected should be radical and thorough, a system of drainage should be established, all manure about the yard should be removed and the stable should be thoroughly cleansed and disinfected from time to time, until all danger is passed. The stable should be made as light and airy as possible and a good coat of whitewash applied to the walls. The cows should also be washed with a disinfectant, or if in summer should be kept out of the stable for a month or two after it is cleansed.

In our endeavors to eradicate this, or any other germ disease, no half measures will suffice, but will end in disappointment and discouragement.

In my experience in endeavoring to control the disease I am convinced that a second or even a third disinfection is advisable, and I may mention the following disinfectants as safe and useful in destroying the germs of this disease: Creolin, Standard Disinfectant, Lysol and carbolic acid. In all cases we should cleanse the floors and walls and every other part af the stable thoroughly with the disinfectant before applying the whitewash.

SHEEP SCAB.

Early in the winter of 1899 I was called to investigate a complaint in regard to sheep scabs in Lenawee county with a member of the Commission. We found that a large number of sheep had been shipped into the locality from the west that had not been properly dipped. But the shippers had built a good dipping plant and had redipped all the sheep that they had sold to the farmers in the vicinity, so that there was little if any danger of spreading the disease.

When we consider the large number of western sheep that are fed in this State and the very careless manner in which many of them are dipped at the yards, we have reason to congratulate our sheep breeders on the care they have taken to prevent the disease from spreading among our native flocks.

I believe that it may be stated with perfect confidence that our native flocks are entirely free from even the suspicion of sheep scab.

PARASITIC DISEASES OF SHEEP.

Although these diseases cannot properly be classed as contagious diseases they are of such a character as to interest and command the attention of your Commission, owing to the fact the ovum of some varieties of these parasites infest the pastures by being deposited by the droppings of the sheep and thus become a source of infection. It therefore becomes the duty of the Commission to endeavor to enlighten the flock owners in regard to these diseases, and to assist in controlling the spread of this scourge in every way possible, as these parasitic troubles are becoming a serious menace to the sheep industry of the State.

Before closing this report I wish to extend my sincere thanks to the veterinary profession throughout the State for their hearty co-operation in endeavoring to carry out the live stock sanitary work. In passing through the various counties in the State I have found all honorable veterinarians ready and willing to render all the assistance in their power to better the sanitary condition of our live stock. I also wish to acknowledge my indebtedness to Prof. Chas. E. Marshall of the Experiment station, Agricultural College, for the valuable assistance so cheerfully rendered whenever the aid of the bacteriologist was necessary to enable us to arrive at a definite conclusion.

All of which is respectfully submitted,

GEO. W. DUNPHY,
State Veterinarian.

NINTH BIENNIAL REPORT

OF THE

LIVE STOCK SANITARY COMMISSION

FOR THE

YEARS 1901 AND 1902

COMPILED BY THE SECRETARY

BY AUTHORITY

LANSING, MICH.
ROBERT SMITH PRINTING CO., STATE PRINTERS AND BINDERS
1903

STATE LIVE STOCK SANITARY COMMISSION.

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REPORT OF THE STATE LIVE STOCK SANITARY COMMISSION FOR THE BIENNIAL PERIOD OF 1901 AND 1902.

Hon. A. T. Bliss, Governor of Michigan:

Sir—The State Live Stock Sanitary Commission have the honor of offering the following report for the biennial period of 1901-1902. Twenty years or more ago the various farmers' organizations, prominent farmers and progressive live stock breeders began agitating the question of legislation of some kind that would tend to protect the live stock industry in some measure at least from the ravages of contagious and infectious diseases of a malignant character. At that time glanders among horses and mules had such a foothold in the State that some of the more easily discouraged and pessimistic breeders were readily predicting that this industry was to become rapidly extinct in Michigan and that the agriculturists of the near future were doomed to pursue their occupation with the assistance of the ox only.

Splenic or Texas fever among cattle was rampant during the summer months in every community where cattle imported from the South chose to land. The cattle pessimist was already saying that the gentle milch cow could not much longer be produced in Michigan, and that the nanny goat of the Swiss mountaineer must supplant her to produce milk upon which to rear our babies or *that* industry be abandoned.

Contagious pleura pneumonia had for a decade or so been devastating the beef and dairy herds of New York, New Jersey, Pennsylvania, Maryland, and the New England state, and individuals from the infected districts or whole migrating herds were slowly but surely spreading this disease westward, it having already gained a considerable foothold in Illinois and some other Western states. Again our pessimistic friend says the milk and meat industry, from the cattleman's standpoint, is surely doomed to extinction, and at a casual glance it looked as if he might be right. Foot-rot from the East and scabies from the ever-infected sheep districts of the West, were causing the nervous shepherd no end of annoyance and alarm. He, too, was scenting troubles unmanageable. Hog cholera, which had annihilated the entire swine industry in whole districts of Ohio and Indiana, was surely, rapidly and insidiously planting its banner on many a Michigan hilltop; and in this connection allow us to say that in the opinion of this Commission this disease—hog cholera, swine plague, or whatever you may choose to call it—in its various phases and manifestations, be it correctly named or misnomer; this plague, let us reiterate, is the most serious menace to the farmer of Michigan that he has to confront to-day. Until such time as the science of materia medica shall exploit some remedy in the form of a curative agent, or antitoxin preventive (and it is in this latter form that the effective treatment will eventually appear, in the opinion of the Commission), until such time, we say, as something not yet exploited or brought to the attention of this Commission, we only ask the privilege of fencing him in with a fence so high that the dog of the farm or the neighbor's farm cannot climb it, the chicken crawl under it, or the pesky English sparrow fly through it, and then lay down at the behest of his majesty, hog cholera, swine plague, pneumonia, call it what you please, it kills them anyway. This largely is history of the condition of affairs of Michigan a quarter of a century ago. To recognize a common danger is to establish a common warfare, with the intelligent American citizen. Individual farmers and farmers' organizations began to discuss ways and means. Curative and preventive measures were exploited; the latter was at once conceded to be the only feasible plan. A Commission with power to quarantine, regulate or destroy, as the exigencies of the case might seem to demand, was readily agreed upon. Large bodies move slowly, but usually act wisely. A committee was appointed to draft bills that would embody the necessary principles of prevention. The result was the drafting of two bills. In the year 1884 they were endorsed at their annual meeting by every live stock association of the State, by the Board of Agriculture, the State Agricultural Society, and hundreds of prominent agriculturists and stockmen in all parts of the commonwealth. They were endorsed by both the outgoing and incoming executive officers of the State. The outgoing Governor, Begole, giving it especial attention in his inaugural address, because it could be made especially useful at just this time, owing to the fact that the general government had, by recent act of Congress, established a Bureau of Animal Industry. The bills were passed by the lower house, practically as drafted, and without serious opposition. They also passed the Senate with the notable exception that the horse and sheep were exempted from the operation of the law. This in actual operation was so plainly unjust to the horse and sheep owner of this State that two years later they were restored to their original place in the bill. This, then, is the sanitary law of Michigan, practically without change, as it stands upon the statute books of our State to-day and under which this Commission operates, and we believe that with slight additional legislation contemplating at least a partial compensation to the owner for animals bred in the State or owned therein for a period of not less than one year, and not considering pedigree or special breeding in fixing value of the stock destroyed under their supervision or direction, Michigan would then have the most complete, protective, efficacious, economical and satisfactory live stock law to be found on any set of statute books in the United States of America to-day. Why do we make this assertion? Because of the results that have been achieved. Where is our pessimistic brother of the glanders-farcy period? Dead and buried, together with the two or three hundred horses that it was necessary to destroy in order to exterminate this disease. Glanders, to-day, while appearing occasionally in isolated localities, is no longer feared by the common populace. Where is the splenic fever crank? He, too, is gone, and with him all fear of the disease, as we are to-day importing and slaughtering thousands upon thousands of beef cattle from the infected districts, but under the established surveillance of this Commission not a dollar's loss from this disease has occurred to the stock owners of Michigan for a dozen years. And pleura pneumonia? Lying directly as we do in the path of the cattle of commerce from West to East, with three of the greatest trunk lines of railroad in existence, traversing the entire breadth of our State, not a case has appeared within our borders since the present law has been in active operation. Foot-rot in sheep is not prevalent, and we do not fear it. Scabies is brought to us occasionally by the importations from the West of the many thousands of feeding sheep, but we can readily control this, and it has not made serious trouble with the native flocks of our commonwealth. Of hog cholera, alone, do we own that we are not masters of the situation, and with the present means at command can only stand with submissive awe in his presence, doff our hat and say, "Please go way, Mr. Cholera; you really must not come here; we do not want you"? When we consider the magnitude of the live stock industry of Michigan, and our relatively small losses from contagious and infectious diseases of a malignant character, while at the same time the expense in supervision being less than that of any other State in the Union, with a single possible exception, having adequate sanitary laws, the ordinary man of affairs may be pardoned for a modest conceit in the conclusion, as the writer concludes, that the framers of the law authorizing the establishment of a live stock sanitary commission, and the simple provisions under which they operate, "builded better than they knew," and the stock owners of Michigan may well felicitate themselves upon the efficacy of the act. Had we the time and disposition, we might offer you a list of statistical evidence as long as the moral law, as impregnable as the rock of ages, and as complete as the system of the universe, in proof of our contention. Modesty forbids; we refrain.

GLANDERS AND FARCY.

That the two diseases are simply different manifestations of one and the same malady is now so universally conceded that we shall assume to treat of the subject under a single head only. The nature and cause of an outbreak of this loathsome and infectious trouble has been so often treated of, and is now so generally well known, that we shall not attempt at this time to take the matter up. Should any reader become particularly interested, however, or has not such information at hand, we would respectfully refer them to the fourth biennial report of this Commission, which treats of the matter more fully, perhaps, than any other gratuitous publication in existence, and a copy of which will be mailed to any interested citizen upon request to any member of this Commission. In handling this disease the Commission have but one method. It having been proven over and over again to be absolutely incurable in practice, our only alternative is to wage an uncompromising and relentless war of extermination. That this sometimes works slight hardship, we must agree, but the intelligent, thinking man must concede that *not* to do so would be but to invite inevitable disaster. Our losses in the aggregate are not great. It is the opinion of the Commission that greater care and attention on the part of every horse owner might reduce the losses to a minimum. During the period covered by this report, twenty-three horses have been destroyed because of this disease. Of this number seventeen of those cases can be traced directly to horses imported from without the State, and most of these are the branded horses coming from the range country of the West. This fact, coupled with the further knowledge that to this same ill-starred, range-bred mustang of the branded herd are we indebted for the first and only invasion of that vile and loathsome disease known to science as maladie du coit, leads the compiler of this report to the individual opinion that the time is not far distant when the horse owners of Michigan will demand that our State be rigidly quarantined against the range-bred horse and our markets denied to him until he shall have first been passed upon by the State Veterinarian as to his freedom from contagious disease, which inspection shall be made at the expense of the owner of the animal or the person desiring to bring him across the Michigan border. We wish in this connection to especially warn our horse owners to be ever on the alert for the symptoms of glanders, and at the first alarm either notify the Commission or a member thereof, or secure the opinion of a competent veterinary surgeon. We may be pardoned if we add a single chapter of Commission history to give weight to this caution. A gentleman well known in the city of Tecumseh came into possession of an animal of little value that showed signs of disease. Competent advice was not sought, but the animal was placed with a more valuable team, which in turn contracted "something" that was not diagnosed as glanders. This team was in the course of business changes sold to a brother, who took them to his barn and placed them in stable and pasture with seven head of valuable animals. This team in time became worthless and were destroyed, but not until one of the more valuable animals above referred to showed positive symptoms of some serious trouble was Dr. Waldron, of Tecumseh, called, when he at once pronounced the difficulty glanders, and notified the Commission of the situation. They at once authorized the State Veterinarian to apply the mallein test to the entire stable, with the result that five of these seven animals, worth in health from one hundred to two hundred dollars each, had to be destroyed. To still further complicate matters, the infected horses had, unwittingly of danger, been allowed to pasture in proximity to a neighbor's horses and colts, who in turn are under the surveillance of the Commission, and no one need be astonished if there are further severe losses in this community. Now, the moral: Had the owner of this original diseased valueless animal called Dr. Waldron at the first signs of trouble, he would at once have recognized the difficulty, the animal would have been destroyed, and the lives of at least five and perhaps seven valuable animals would have been saved, and "the end is not yet." Let us adjure you, gentlemen, that in dealing with this disease "eternal vigilance is the price of success." Fight mighty shy of the suspicious-looking animal of the professional "hoss-trader" that has "taken a bad cold" or had his legs "badly pricked with barbed wire." He may be a dangerous brute. Do not harbor him. That man himself is equally susceptible to this malady as the horse should lend additional reason for caution and make the careful person still more loath to harbor the suspicious animal.

MALADIE DU COIT.

To the year 1902 may be given the credit, we believe, of the first serious invasion of this vile disease into Michigan. The history of the case is as follows: In August of that year a carload of thirty-two horses, consisting of mares, geldings and stallions, were shipped from Buffalo Gap, South Dakota, to Kalamazoo, Michigan, and trailed from there across country to Prairieville, Barry County, and dispersed at acution or by private treaty from Prairieville and Hastings. Of this load two mares and two stallions were from the farm of one B. O. Ewing, quarantined by the United States Government because of this malady. As all the mares of the shipment were herded for a period of two or three months with the stallions from the infected district, and at least one of these stallions is believed to be affected, it will be readily seen that every mare in the herd has been exposed and is an object of suspicion. In addition to this, there are several native mares of more or less value, in the vicinity of Prairieville, that have also been allowed to herd or pasture with these same suspected stallions that have thus been exposed, and must therefore be regarded with suspicion and be as carefully and rigidly guarded as those of the original shipment. For some reason unknown to the writer, while these animals left South Dakota late in the summer, the matter was not brought to the notice of this Commission by the United States authorities until about the middle of December following. The entire Commission, together with the State Veterinarian, at once took the matter in hand, with the result that all stallions were placed in quarantine or castrated and the mares were placed in quarantine by the supervisors of the several townships in which they were located. As the disease is contracted only by copulation, the castration of the stallions removes them from being a further source of danger, but the mares will be rigidly held in quarantine until all danger is believed to be past, and every mare developing the disease will be destroyed.

The greatest danger to the horse interests of the vicinity is that some one of these mares, being infected, may be bred to a valuable native stallion, who in turn would not only contract the disease for himself, thereby insuring his ruin, but would also infect and ever after ruin every native mare he might cover. The Commission confidently expect. however, that with the active, intelligent and hearty co-operation of the supervisors of the several townships, notably Prairieville, Orangeville, Hope, Irvin and Hastings townships, in Barry County; Martin township, in Allegan County; also Climax township, in Kalamazoo County, which so far has been cheerfully given, that the trouble will be entirely confined to the horses of the original Western shipment and those natives already exposed, which are comparatively valueless. We wish, however, to caution, in this connection, every stallion owner in these communities to be on the alert for any evidence of this trouble, and should his suspicions at any time be aroused, to refuse, for his own financial protection, if for on other, to allow his horse to cover the mare in question and to immediately report the matter to this Commission or some member thereof.

ACTINOMYCOSIS AND TUBERCULOSIS.

As this Commission have made no new discoveries, neither have they any new theories to exploit in connection with these diseases, we shall take the liberty of quoting almost verbatim from our eighth biennial report upon these subjects. Actinomycosis does not give us grave alarm, but will continue to receive the attention of this Commission when reported to us. To those especially interested in the question of tuberculosis and the tuberculin test, we would say that the matter is more fully treated upon in the seventh report than in any other, and will be mailed upon request. From our eighth biennial report we quote the following on these subjects:

ACTINOMYCOSIS.

A decade ago actinomycosis, or lumpy jaw, was exceedingly common in several counties of this State and caused considerable loss to cattle-growers in some localities.

At that period a series of experiments were carried on at the experiment station under the direction of this Commission to learn more about the communicability of the disease. But little was learned from the experiments. In fact, it may be said the results were negative. The disease appeared in a sporadic manner but spread in certain localities with considerable rapidity. It was apparently epidemic or epizootic in the localities referred to. However, it rapidly ran its course and ceased its extensive depredations as mysteriously as it came. From that date to the present isolated cases are appearing in different portions of the State, not attended with serious loss in any locality. The disease when treated in its early stages seems to respond favorably in a large majority of the cases.

The Bureau of Animal Industry, in behalf of the general government, have carried on very extensive experiments for its cure. The manner and mode of treament are fully set forth in Bulletin No. 2, United States Department of Agriculture, Bureau of Animal Industry, from which we quote:

Treatment.—"The medicine used by the Bureau of Animal Industry in the treatment of actinomycosis, or lumpy jaw, is the iodide of potassium. The dose should never exceed one-quarter dram for every 100 pounds of live weight. The proper dose being from two to three drams, according to the size of the animal and the extent of the disease. This dose may be given once a day for from five to six days, when the animal may show slight symptoms or iodism, viz.: Discharge of thick mucus from the nose and flowing of tears. The animal will become constipated, perhaps, but this may be easily remedied by giving a dose of glauber salts and some bran mash. This will restore the appetite, and two days after the last dose was given the animal be ready for another week's treatment, and so on until a cure is effected. If these precautions are taken no ill effect will result from the treatment, and if properly fed the animal will gain in condition uninfluenced by the medicine. There is, however, a great difference as to the effect of the medicine on different animals, but any farmer who takes an interest in seeing his stock do well will easily perceive when it is best for him to stop and give the animal a rest for two or three days. The medicine is best given dissolved in soft water and given by means of a horn or long necked bottle. One dose of the medicine, say one and one-half to two or three drams, as the case may seem to require, is dissolved in about a pint of water, seize the animal by the nose to hold up the head, and the contents of the bottle is emptied into the mouth without fixing or securing the tongue in any way."

The medicine is not expensive and can be procured at any drug store, and if the farmer has not suitable scales it can be put up in desired doses by the druggist. A large per cent of the cases treated with this remedy have been reported cured, and the treatment is well worthy of a trial. Our observation with the many cattle we have had under our charge in this State leads us to conclude that many cases may be cured in the early stage of development by the use of the knife.

TUBERCULOSIS.

The subject of tuberculosis, a disease to which the bovine is highly susceptible, is not so easily disposed of. If this disease is to be dealt with in a manner looking to its suppression, additional legislation will be highly essential. This legislation should contemplate remuneration to owners of infected cattle. It should contemplate the proper manner of carrying along breeding animals to protect the young from infection. It should contemplate the inspection of meat of slaughtered animals showing slight lesions of the disease with a view of utilizing such of it as proved to be wholesome. What is known as the tuberculin test as a diagnostic agent in this particular disease is truly wonderful in its accuracy in determining all or nearly all of the infected animals, only occasionally failing to react in case of an animal having lesions of the disease, and seldom reacting in case of an animal not affected. However, it makes no sort of determination of the degree to which an animal is affected. You may have two perfectly typical reactions, or two dozen, if you please, quite as typical. The post mortem will or may disclose that each and every one of these cattle were affected, but you will find all stages or degrees of infection. You will find an animal with its glandular and pulmonary systems terribly, desperately affected. Evidently the diseased brute is daily, probably hourly, throwing off broken up nests of the tubercle bacilli to infect its associates and perhaps even man himself. On the other hand, you will find another animal in the same lot with an equally typical reaction that is fine and sleek and in physical appearance in perfect health. Post mortem may determine that the animal is affected with the disease. But how affected? You may find upon the closest scientific examination that the entire affectation may be a slight lesion of a small gland or two, and the ordinary everyday man of affairs has a perfect right to conclude, as the writer concludes, that this animal, as far as tuberculosis was concerned, had it been removed from further infection except what it had already imbibed, might have lived for a long and useful career and finally died of old age.

BLACK-QUARTER OR SYMPTOMATIS ANTHRAX.

Very little trouble has been experienced in the State in the last biennial period from this difficulty. A more or less serious outbreak in the vicinity of Elk Rapids, Leelanau County, in 1901, a loss of a few head near Plainwell, also a few at Zeeland, Allegan County, in the same year, and a single outbreak in Charlevoix County, in 1902, cover the losses reported to this Commission. A correct diagnosis of this disease at its first appearance and prompt application of the preventive process, with the now well established Anti-Black Leg Vaccine, the material for which may be obtained of the Bureau of Animal Industry or through the usual channels of the drug trade, as it has now become a recognized article of commerce, will in most cases save from serious losses. From the third biennial report of this Commission we quote: "Anthrax is a disease known under different names, among which are black leg, black tongue, black quarter, etc., which include a group of diseases very virulent, malignant and contagious, appearing in different forms externally and internally, and attacking the different species of lower animals and man himself, in an epizootic, enzootic or sporadic manner, according to the influences that produce it, or whether it is got by inoculation; it sometimes arises spontaneously in low, damp, rich pastures and along the banks of overflowed streams, or where ponds have been drained off or dried up, the soil containing a large amount of organic matter. Long continued warm, dry weather forming the emanations of organic matter and miasmatic gases, form its development."

A PECULIAR MALADY

In cattle that has, and is, giving us no little uneasiness and concern has made itself obnoxiously prominent in some of the northern counties of the Lower Peninsula, and has been especially fatal in the latitude of Charlevoix, Grand Traverse, Kalkaska, Oceana, Crawford, and Iosco counties. The peculiar and exasperating features of this desperately fatal malady is its "lack of symptoms." It is also no respecter of persons in choosing its victims for attack. The thrifty, growthy, well-bred, well-housed, well-cared-for, and all-round sportive steer of the wealthy merchant-farmer will be attacked and succumb to its ravages as readily as the hump-backed, bare-ribbed cow of the backwoods trapper, whose roof is the blue sky of heaven, whose drink is the melted snow she licks from the rail fence, and whose ration is the browse of the primeval forest. Indeed, our observation of this trouble has been confined very largely to the animal who might seem to be reveling in luxury, to the envy of his less fortunate and covetous neighbor. The post mortem has as yet revealed nothing as to the nature, cause or remedy. The internal organs seem to be perfectly normal, except for the ever-present enemic condition that cannot be accounted for. The animal, who, mayhap, is seemingly in perfect condition, suddenly shows loss of appetite, grows thin and ill, literally starving to death in the midst of plenty until he becomes so weak and emaciated that one must needs hold him up to knock him down. The Commission has given much attention and has had many misgivings regarding this malady, but as yet seem to have made little or no headway toward a solution of the problem. We started on the theory that some poisonous weed or herb was doing the mischief, and with this idea in mind induced the experiment station to send a botanist to the trysting place of this mighty little tyrant in Kalkaska County. Prof. Wheeler, a man most skilled in botanical knowledge, made a minute and careful study of the fields and forests in this vicinity for a period of several days, but failed to find a plant of any description which he was willing to accuse of being the wilful murderer of these animals. A new laboratory for the scientific investigation from a bacteriological standpoint, and examinations of anything in the nature of animal troubles is now nearly ready for equipment and will, before this report is in print, be in active operation at the Agricultural College, under the direction of that skillful and most efficient scientist, Prof. Chas. E. Marshall, and the experiment station has promised that as soon as this institution is ready it will be glad to take this matter up at the first outbreak thereafter, in a systematic and thorough manner, and that no stone will be left unturned in the effort to bring relief to this much afflicted territory. We are hoping for better things and trust that ere the next biennial report of this Commission shall be issued that we shall be able to show that progress has been made in arresting this malady.

CONTAGIOUS OPTHALMIA.

While isolated cases, or perchance slight outbreaks of this disease have been known in Michigan since time itself began this biennial period, and particularly the year 1902, has presented more serious problems from its invasions than any previous one in the history of this Commission. That it is a highly contagious or infectious disease, there is no longer any room for doubt. Scientists tell us that a specific germ has not as yet been isolated and recognized. Be this as it may, the ordinary everyday layman, who has given the subject his careful thought and observation, as have the members of this Commission, are sure to be readily convinced that it is a highly communicable disease. That a single diseased animal may quickly infect a whole herd, and, furthermore, that stables, and possibly pastures, even, may become infected to such a degree that they become dangerous to the healthy animal. Every case of contagious opthalmia that has been brought to the attention of this Commission was quickly and easily traced in its origin to Western cattle that had been brought here for feeding and other purposes. The malady does not seem to be an especially serious menace to the Western cattle themselves, but becomes vastly more malignant in its character when transmitted to our native cattle stock. Very few, if indeed any, cattle actually die from this disease, but when allowed to spread at random it causes very serious losses in lack of thrift, decrease in weight, ill condition, etc. Very many animals will lose the sight of one or both eyes, while others will be but slightly affected, and seem to entirely recover within a reasonable period. The Commission have given this matter much attention during the late summer and fall months of 1902, and while it has been urged by some that extreme quarantine regulations against all Western cattle should be adopted, the Commission, after giving the matter a careful and systematic investigation, are of the unanimous opinion that the cattle interests of the State would, by any such arbitrary measures, be vastly more injured than the exigencies of the case would demand. We are importing from the range districts of the West thousands upon thousands of unfinished cattle yearly to feed upon our grains and richer nitrogeneous foods, that the broad prairies of the grazing country and the range conditions that there prevail do not and cannot furnish. To annihiliate this industry would be to work almost irreparable injury to our agriculturists, and until such time as the menace from this disease shall become much greater than it now seems to be, extreme measures will not be resorted to by this Commission. We shall, however, continue to give this matter our most careful attention. We shall insist upon the immediate isolation and that rigid quarantine regulations be observed in every outbreak of the disease, and the cattle importer or drover who shall evade or attempt to evade any such rules or regulations, howsoever stringent they may seem to be, when he shall be in the presence of this malady, will, we apprehend, find his business very seriously curtailed on short notice. We are very glad to note, however, in this connection, that so far as we have yet had to deal with this difficulty, we have found that owners of and dealers in this Western cattle stock are not only willing, but seemingly anxious, to co-operate with and acquiesce in the demands and suggestions as made by us. We shall continue to give this matter our careful attention and also desire to request that all importers of and dealers in Western cattle exercise the greatest care in the selection of their animals, giving especial attention and the closest observation for any signs or symptoms of this eye trouble, and refuse to buy anything that might give cause for suspicion. We believe that if the above outlined precautions will be carefully observed and that if every cattle owner in the State will promptly report to this Commission or some member thereof any outbreak of this disease at its first appearance, that we shall be able to protect the stock breeders of Michigan without bringing serious inconvenience upon the range cattle importer or crippling the feeding industry of the State. That this malady may be readily recognized by either the scientist or the layman, we shall herewith quote from the report of State Veterinarian Dunphy, as carried in our eighth biennial report. In speaking of contagious opthalmia, Dr. Dunphy says:

This disease consists in more or less violent inflammation of the delicate membrane lining the eyelids and of the transparent tissue which constitutes the cornea or front of the eye-ball. The inflammation in many cases is so intense that it involves all the structures of the eye and in such cases causes adhesions and total blindness. The disease is undoubtedly caused by some micro-organism, although the germ has not yet been positively identified. There is no doubt, however, that it is highly contagious and whatever the causative agent, it seems to be rapidly transmitted from animal to animal, either by direct contact or by contact with infected fences, or possibly through the air.

The first symptoms resemble the ordinary simple ophthalmia, consisting of swelling of the eyelids and a congested condition of the conjunctiva, and a flow of tears. In the latter stages, a deposit forms between the two coats of the eye, and the cornea becomes white and opaque. The discharge from them becomes more sticky and albuminous as the disease progresses, and assumes the character of a creamy looking pus. The sunlight seems to have a very painful effect on the eye, and the afflicted animals suffer very much to all appearance when exposed to the light, and are inclined to seek dark or shady places that are not exposed to the sun's rays.

I have noticed cases where the cornea had ulcerated and perforation resulted, and the whole contents of the front chamber of the eye had run out, and the eye was completely destroyed. Inquiry into the history of these cases showed that the disease varied in different cases from ten days to three weeks, and I am inclined to believe that with rational treatment, a complete recovery would result unless ulceration of the cornea takes place. The progress of the disease should be checked as quickly as possible by the early isolation of the afflicted cattle, and a thorough disinfection of the premises, where they were kept, such as watering troughs or stables if the animals were housed. Animals under treatment should be placed in a darkened stable, and warm water and mild antiseptics and anodynes used. We cannot too strongly condemn the pernicious practice of using such irritants as burned alum or spitting tobacco juice into the eye of the afflicted animals, and I am inclined to believe that some of the disastrous results of the disease in the animals I inspected came from this cruel and filthy treatment.

We are glad to be able to class the author of this report as among the most competent of his profession in this State.

FOOT AND MOUTH DISEASES.

The prevalence of this extremely insidious, troublesome malady in the New England states has been the cause of much activity on the part of the Bureau of Animal Industry in an effort to confine the disease to its initial quarters and eventually stamp it out entirely. That they will be entirely successful we do not for a moment doubt, in fact they are at this date reporting that they have it in complete subjugation. Notwithstanding, the Commission are giving the matter close observation, and while there has not as yet been a quarantine proclamation issued, owing to the fact that there are practically no importations from that quarter, and also that the United States authorities are allowing nothing to come this way, the stock owners of this State may rest assured that we shall be ever watchful of their interests, and feel safe in saying that no case of the disease will be brought into our jurisdiction.

RABIES—HYDROPHOBIA.

In our eighth biennial report the writer of this article made this observation: "During the two preceding years (1899 and 1900) rabies have given us but small concern; that it has not become more prevalent is a matter of some surprise to this Commission and not less of congratulation."

The expected has happened, and the season of 1902 has developed more rabies in Michigan than has ever before been known in the history of this Commission. It has not been confined to any particular section, but has caused no. inconsiderable loss in more than twenty different counties of the State, and the record of fatalities in the human family is abnormally large. The method of handling this difficulty is to rigidly quarantine or securely muzzle every dog in a suspected territory under the supervision of the supervisors of the several townships until such time as the extent of the infection or the absolute correctness of the diagnosis may be positively determined, when every dog known to have been bitten by a rabid canine will be destroyed. It has not been the policy of the Commission to order the destruction of domestic animals, even though known to have been bitten by a supposedly rabid dog, as not all such develop the disease, and should they show symptoms of the malady they may then be destroyed to save them several days of intense suffering, as death is inevitable. We do not know that any animal other than the dog does convey this disease, with the possible exception of the domestic cat, and Tabby, being a nimble lass, is likely to take to the backyard fence or the convenient cherry tree when the rabid dog is abroad, from which vantage ground she spits defiance at her tormentor until he goes his way; thus she is not likely to be bitten; but should she be, then by all means destroy her at once, for her domestic nature and natural tendencies to be the comrade and boon companion of the babies make her a doubly dangerous creature should she become afflicted with the malady. In a supplement to the report of the State Board of Health for 1895, we find the following, which is so exactly applicable, and withal so very sensible, we shall take the liberty of quoting it verbatim, without the permission of Dr. Baker, which permission, we are sure, would be freely and cheerfully granted had we opportunity to seek it.

RULES AND REGULATIONS SHOULD BE FRAMED AND PUBLISHED.

One of the most efficient means employed for the restriction of the spread of rabies is a set of rules which shall regulate the action and movement of animals infected with the disease. Each local board of health should frame and publish (in accordance with the State laws) rules which would enable the health officer to act promptly upon the appearance of a case of this disease so dangerous to the public health and life. If a health officer is obliged to wait until the local board can be called together the disease may have been allowed to spread instead of restricting it to the first case. On the occurrence of a case of rabies the fact should be reported to the local health officer and promptly restricted by him in accordance with act 137, laws of 1883. The health officer should, in compliance with sections 5 and 6, act 125, laws of 1889, report the fact to the Live Stock Sanitary Commission. The local health authorities should isolate the animal or animals and keep them so until they are taken care of by the State Live Stock Commission or State Veterinarian; but under no circumstances should the local health authorities fail to guard the public health and life. Whether in man or animals the full fact regarding the outbreak of the disease should be reported to the secretary of the State Board of Health at Lansing. In the cities the "dog ordinance" generally regulates the action of animals most likely to be infected with rabies. Every city should be equipped with an efficient ordinance and should demand its strict enforcement. An ordinance may be ever so efficient, but if not enforced, is useless, and the stray and ownerless dogs will be permitted to roam about the cities to become infected with rabies and transmit the disease to human beings. For the restriction of the spread of rabies and hydrophobia, it is important that prompt action should be taken with any suspicious animal. When a dog or other animal acts strangely and there is suspicion of madness, the animal should be immediately confined, not killed, and kept under observation for a week or ten days. Have the animal examined by a competent physician or veterinary surgeon, and if the animal is rabid the characteristic symptoms will soon be observed. Pasteur says the animals will certainly die within eight days. If at the end of that time no symptoms of rabies have been observed the bite cannot cause hydrophobia, and there is no reason why the animal should be destroyed. If symptoms of rabies do appear in the animal thus under observation, it should be immediately killed. And, if the animal has bitten a human being, a small portion of the medulla oblongata should be secured and placed in a small vial containing pure glycerine only, for use in experimental inoculations of other animals to determine without doubt whether the animal suspected of rage was really rabid. If other animals have been bitten by a suspicious animal they should likewise be confined until it is proven whether or not they are rabid, or until the period of incubation has passed. It is quite frequently the case that valuable stock has been bitten by animals not rabid, and it would be a useless destruction of property to destroy such animals. Do not kill an animal unless you have good reason to believe it is rabid, or unless it is a source of danger to other animals and to human life. Of course a dog may run mad when it is quite impossible to secure the dog, and extremely dangerous for it to run at large, where shooting the animal may be the only safe way. In such a case the animal should not be disposed of until it is absolutely certain that no person has been bitten. If a person has been bitten a portion of the medulla should be prepared as described above. If a human being has been bitten and the animal is destroyed there is no way left to ascertain whether or not the dog was really mad, and whether the person bitten has been inoculated with the virus of this terrible disease.

If precautions as above outlined are taken, we do not think any unusual apprehension need to be felt in regard to rabies.

DISEASES OF SHEEP.

In the eighth biennial report the writer of this article, under a heading similar to this, gives considerable space and attention to what he there terms the Anthrax Scare. Later developments have proven most conclusively that the position taken by Dr. Dunphy, the Bureau of Animal Industry and the Sanitary Commission at that time was incontrovertibly correct, and that a single case of true anthrax does or has existed in Michigan, no sane person can now well contend. The further situation in the matter of sheep and swine troubles is so exactly similar to that of the last biennial period that we shall take the risk of being called tedious, narrow and prosy by quoting very largely, verbatim, our observations in the eighth report.

Since issuing the last biennial report this Commission has perhaps responded to more calls from flock masters than in the whole previous history of the Commission. Nearly every case of fatality has proven on careful examination to have been caused by internal parasites. Parasites are living animal organisms that extract nourishment for their existence from the tissues of their host. In sheep we find that parasites are the cause of many of the most serious diseases. They invade all the organs of the body from the brain to the rectum, their multiplication and resultant damage being in direct proportion to the neglect and bad management on the part of the flock owner. Of all the numerous internal parasites we have to contend with the twisted stomach worm (strongylus contortus) is perhaps the most prevalent and responsible for the most fatalities. The strongylus contortus inhabits the fourth stomach of sheep, and while it does not cause any great disturbance, usually among the adult sheep, I think I am safe in saying that it has been the cause of more financial loss to farmers and flock owners of Michigan during the summer of 1900 in its fatalities among the lambs than all other diseases of the sheep combined. These parasites may be found adhering by their heads to the mucous membrane of the stomach. They are of a reddish color and feed principally, we are told, upon the blood of the animal. These little worms when present in large numbers ofttimes appear like masses of threads from one to one and one-half inches in length. If the animal has been killed for examination the worms may be seen wriggling and squirming in all directions, and the writer has even found them in balls as large as a hen's egg. Their presence in large numbers causes great weakness, considerable fever and ofttimes aggravated diarrhea. A dropsical swelling under the chin will usually be seen; the eyes, lips and tongue are very pale; the animal loses appetite, mopes around and is always thirsty, consuming large quantities of water, if able to get it, and contrary to the usual nature of sheep, seem almost to prefer to drink from some filthy pool rather than a clean trough. The blood becomes pale and watery. The parasites develop somewhat slowly and their presence may not be discovered by the indifferent flock master until one or more fatalities have occurred. If you have done nothing until this occurs your losses will be large. Treatment of this disease has so far not been very successful. The gasoline and milk treatment being perhaps as good as anything yet tried. Immunity from severe losses with this disease must then be by prevention. It is the opinion of the writer of this report (the Secretary of the Commission, who is the owner of a flock of pure bred sheep), based upon several years of actual experience, that when our flock owners shall have awakened to the absolute necessity of taking early preventive measures that their losses may be reduced to a minimum. This should commence as soon as the lamb begins to eat. I am satisfied that the time honored biblical phrase, "they that are well need no physician," is not applicable to this case, for in 95 per cent of the cases of strongylus contortus in lambs, "they that are sick" need only the undertaker. We have not found this disease particularly prevalent in one locality, but have found it creating sad havoc among the lambs in almost every county in the State where sheep are kept.

Since the last biennial report no cases of foot-rot have been reported to this Commission, and while this is not proof positive that no case now exists in the State, we are of the opinion that no serious outbreaks have occurred. The methods of treatment and the entire elimination of this disease from a flock that may have contracted the disease is now so well known that we do not apprehend that the flock masters of Michigan need have any uneasiness regarding it.

SCAB.

Scab has only been reported to the Commission from a few townships, and while we are of the opinion that there has been other outbreaks than this, the sheep owners have been so fully alive to the necessity of handling it rapidly, thoroughly and well that it has not been the cause of serious difficulty. We do not think the native sheep of Michigan are affected with this disagreeable malady, and where it has been found it has come to us with Western sheep that have been brought in for feeding or other purposes. While this disease, if left to run its course, will cause serious losses, it is not difficult to eradicate. Dipping, dipping, dipping, thorough dipping is the remedy. We would advise very strongly against the use of lime and sulphur dip, as the almost universal testimony of the best sheep men and wool buyers and manufacturers, as well as the personal experience of the writer of this article, is that it is positively very injurious not only to the wool but to the sheep as well. That it will cure scab if used thoroughly enough and hot enough, we do not deny, but that it will also kill the life of the wool, and seriously injure at least fifty per cent of the sheep so dipped, is equally true. There are dozens of good proprietary dips that are fully as efficacious in the curing of scab, and can be used without the attendant risks. The question of cost cuts comparatively no figure with the small Michigan flocks, as the expense for material with any good standard dip is not more than a cent or two per head at most, if dipped with the wool off. Happy is the flock owner who has not yet made the acquaintance of sheep scab, but that he may readily recognize it if it should by chance misfortune invade his flock, we here append a clipping from Bulletin No. 21, U. S. Department of Agriculture, a careful reading of which will make the discovery and diagnosing of the disease a comparatively easy matter, and give the flock master, we hope, as intimate an acquaintance with his majesty "Psoroptes communis" as he may ever be called upon to make.

To recapitulate, let us say the only serious diseases of sheep that are confronting the flock owners of Michigan are foot-rot, scab and internal parasitic diseases. Foot-rot is now under control. Scab when appearing may be readily and effectually stamped out. But for the dreaded internal parasites that have caused such serious losses to our flock owners during the summer months of 1900, until such time as the science of materia medica shall have given us a more efficacious remedy than those we have yet tried, we must wage a continual warfare of prevention if we would save our flocks from its ravages.

DESCRIPTION OF SHEEP SCAB.

COMMON SCAB, BODY SCAB OR PSOROPTIC SCAB.

Although the symptoms of common scab are familiar to most farmers, they will here be briefly reviewed.

The mites of common, or body scab—that is, Psoroptes—prick the skin of the animal to obtain their food, and probably insert a poisonous saliva in the wound. Their bites are followed by intense itching, with irritation, formation of papules, inflammation, exudation of serum, and the formation of crusts, or scabs, under and near the edge of which the parasites live. As the parasites multiply they seek the more healthy parts, spreading from the edges of the scab already formed, thus extending the disease. The sheep are restless; they scratch and bite themselves, and rub against posts, fences, stones, or against other members of the flock. This irritation is particularly noticeable after the animals have been driven, for the itching is more intense when the sheep becomes heated. The changes in the skin naturally result in a falling of the wool; at first slender "tags" are noticed; the fleece assumes the condition known as "flowering;" it looks tufty or matted, and the sheep pulls out portions with its mouth, or leaves tags on the objects against which it rubs. Scabs fall and are replaced by thicker and more adherent crusts. The skin finally becomes more or less bare, parchment-like, greatly thickened, furrowed and bleeding in the cracks. With shorn sheep, especially, a thick, dry, parchment-like crust covers the greatly tumified skin. Ewes may abort or bear weak lambs.

Parts of Body Affected.—When sheep are kept in large numbers the chances for infection are naturally greater, and the disease may begin on almost any part of the body. Generally, however, it affects the parts which are covered with wool. When the sheep are fat and the wool has a large amount of yolk, the progress of the disease may be slow; usually beginning on the upper part of the body, withers and back, it extends slowly, but none the less surely, and in ever-increasing areas, to the neck, sides, flanks, rump, etc. In two or three months the entire body may be affected.

Contagion.—Common scab is exceedingly contagious from one sheep to another, and may in some cases show itself within about a week after healthy sheep have been exposed to infection. The contagion may be direct, by contact of one sheep with another; or indirect, from tags of wool, or from fences, posts, etc., against which scabby sheep have rubbed, or from the places where the sheep have been "bedded down." One attack of scab does not protect sheep from later attacks.

Chances of Recovery.—Cases of apparent spontaneous recovery are rare. Usually when proper methods of treatment are not adopted the disease increases, leads to anæmia, emaciation, exhaustion and death, and may result in a loss of from 10 to 80 per cent of the flock. Scab is favored by seasons when the wool is longest, and by huddling or overcrowding the animals; also race, energy, temperament, age, state of health, length, fineness and abundance of wool, and the hygienic conditions of the surroundings influence the course and termination of the disease. Young, weak, closely inbred animals, and those with long, coarse wool will most quickly succumb. Unhealthy localities, damp climate and poorly ventilated sheds favor the disease. Pure or mixed Merino sheep succumb sooner than certain other breeds. The mortality varies according to conditions, but is highest in autumn and winter. When owners are careless the death rate may be very high; if untreated the sheep may die in two or three months. Hygienic conditions, good food and cool, dry atmosphere tend to check the disease. Sheep sheds should accordingly be well ventilated and open to light and sunshine. With proper attention to hygienic conditions and thorough dipping, a positive cure can be guaranteed.

Vitality of the Parasite.—Taken from the sheep, the mites possess a remarkable vitality. It is generally stated that, kept at a moderate temperature on portions of scab, the adults may live from four to twenty-days, but they will occasionally live much longer; cases are on record where they have lived three, four, or even six weeks when separated from sheep; if the atmosphere is dry they will generally die in about fifteen days; but death is often only apparent, for the mites may sometimes be revived by warmth and moisture even after six or eight weeks; the fecundated females are especially tenacious of life. Various, rather contradictory statements may be found regarding their resistance to cold. Krogman states that they may live at a temperature of minus 10° C. (+14° F.) for twenty-eight days. Other authors claim that the mites die in two hours at 47° F., still other authors, that they die at 50° C. (122° F.) They are said to have been kept alive in cold water for six days and in warm water for ten days. Several authors admit, however, that the parasites are uually killed by a soaking rain; though it is claimed that in damp, dark stables they "may live for months."

Experience has shown that in some cases apparently healthy sheep have become infected in places where no sheep have been kept for four, eight, twelve or even twenty-four months. The conditions underlying this infection are not thoroughly understood. Possibly some of the eggs have retained their vitality a long time and then hatched out; possibly the vitality of the fecundated female has also played a rôle; while it is not at all improbable that an entirely new infection has accidentally been introduced by birds or other animals. Certain authors of high standing scout the idea that birds can introduce an infection of scab, but there is no reason why birds should not do this, and there are some reasons for believing that they do. It has been noticed on the Experiment Station of the Bureau, for instance, that crows delight in perching on the backs of scabby sheep and picking at the scab. While so doing it is only natural that small tags of wool should adhere to their feet, and thus scatter scab. The fact that snails cling to birds' feet and are carried long distances is too well established to need discussion, and it is very probable that many of the cases where sheep are supposed to have become infected with scab on pastures which have not been occupied for one or two years are in reality cases of fresh infection by means of birds. From the data at hand, while it may be admitted that in some cases, under favorable conditions, the mites may live from spring to fall, it is scarcely within the limits of probability that either the scab mites or their eggs will live through a winter when separated from the sheep and exposed to the elements.

All matters connected with the vitality of the scab mite have an important bearing in explaining cases of indirect infection on roads over which scabby sheep have been driven, or in fields and sheds where they have been kept. From the facts now at our disposal we can lay down the following important rules:

(1) Scabby sheep should never be driven upon a public road; (2) sheds in which scabby sheep have been kept should be thoroughly cleaned, disinfected and aired, and should be left unused for at least four weeks (better two months) before clean sheep are placed in them; (3) fields in which scabby sheep have been kept should stand vacant *at least four weeks* (better six or eight) before being used for clean sheep; (4) a drenching rain will frequently serve to disinfect a pasture, but it is well to whitewash the posts against which scabby sheep have rubbed. Even after observing the precautions here given it is not possible to absolutely guarantee that there will be no reinfection, but the probabilities are against it.

Life History of the Parasite.—A study of the life history of the scab parasite is necessary in order to determine several important points of practical value, such as the proper time for the second dipping, etc.

The female mite lays about 15 to 24 eggs on the skin, or fastened to the wool near the skin; a six-legged larva is hatched; these larvæ cast their skin and become mature; the mites pair and the females lay their eggs, after which they die. The exact number of days required for each stage varies somewhat, according to the writings of different authors, a fact which is probably to be explained by individual variation, and by the conditions under which the observations and experiments were made. Thus Gerlach, in his well-known work (1857), estimates about fourteen to fifteen days as the period required for a generation of mites from the time of pairing to the maturity of the next generation. He divides this time as follows: Under ordinary conditions the eggs hatch in three to four days, although two authors allow ten to eleven days for the egg stage; three or four days after birth the six-legged larvæ moult and the fourth pair of legs appears; this fourth pair is always present when the mites are two-thirds the size of the adult; when seven to eight days old the mites are mature and ready to pair; several (three or four) days are allowed for pairing; another generation of eggs may be laid fourteen to fifteen days after the laying of the first generation of eggs. Without going into all of the other observations on these points, it may be remarked that the eggs may not hatch for six or seven days; the six-legged larvæ may moult when three to four days old, and become mature; after pairing a second moult takes place, lasting four to five days; a third moult follows immediately, then eggs are laid and the adults die; in some cases there is a fourth moult, but apparently without any further production of eggs. Accepting Gerlach's estimate of fifteen days as an average for each generation of ten females and five males, in three months' time the sixth generation would appear and consist of about 1,000,000 females and 500,000 males.

Several practical lessons are to be drawn from these figures: First, it is seen that the parasites increase very rapidly, so that if scab is discovered in a flock, the diseased sheep should immediately be isolated: second, if new sheep are placed in a flock, they should either first be dipped, as a precautionary measure, or they should at least be kept separate for several weeks to see whether scab develops; third, since the chances for infection are very great, the entire flock should be treated, even in case scab is found only in one or two animals; fourth, as dipping is not certain to kill the eggs, the sheep should be dipped a second time, the time being selected between the moment of the hatching of eggs and the moment the next generation of eggs is laid. As eggs may hatch between three and seven (possibly ten or eleven) days, and as fourteen to fifteen days are required for the entire cycle, the second dipping should take place after the seventh day, but before the fourteenth day; allowing for individual variation and variation of conditions, the tenth, eleventh or twelfth day will be the best time to repeat the dipping.

IMPORTANCE OF PROPER USE OF DIP.

Whatever dip is selected, the farmer should not forget that there are two ways to use that dip. One way is to prepare and use it in accordance with the directions given; the other way is to attempt to economize time, labor, or money by using the dip in weaker proportion than advised, by hurrying the sheep through the swim, or by later placing the dipped sheep under unfavorable conditions. If the former method is adopted with any of the established dips, the treatment ought to be followed with favorable results; but if the latter method is adopted, the farmer himself must assume the responsibility of failure, no matter which dip he decides to use. Every farmer should therefore remember that when he has decided upon the dip he is to use his work is only begun; to use the dip properly is fully as important as to use a dip at all.

The Pastures.—In case it is necessary to place the dipped sheep on the same pastures they occupied before being dipped, it is always best to use a dip containing sulphur. If a proprietary dip is selected under those circumstances, it is suggested that sulphur be added, about 1 pound of flowers of sulphur to every 6 gallons of dip. In case it is possible to utilize fresh pastures after dipping, the use of sulphur is not so necessary, but is always advisable. The object in using sulphur is to place in the wool a material which will not evaporate quickly, but will remain there for a longer period of time than scab parasites ordinarily remain alive away from their hosts. By doing this the sheep are protected against reinfection.

SWINE PLAGUE AND HOG CHOLERA.

The ravages of these two forms of swine disease in many of the counties of Michigan, each season, have invariably caused greater losses to the farmers of the State than all other diseases combined. The State Live Stock Sanitary Commission has responded to calls from farmers, and local health officers, and, whenever possible, the Commission, or a member thereof, has personally visited the infected districts and endeavored to assist the farmers in fighting this terribly destructive disease and reducing its fearful ravages.

The United States Bureau of Animal Industry is constantly employing scientific experts to experiment with and investigate every form of treatment and inoculation of swine to cure swine plague and hog cholera, but with very unsatisfactory results.

PREVENTION FAR BETTER THAN A CURE.

It is during the hot summer and fall months that these swine diseases ravage so many townships in some of the southern counties of the State. When an outbreak occurs the farmer is usually willing to adopt almost any stringent or heroic measures to save his swine. When we consider the actual sanitary conditions surrounding thousands of hog yards, pens, sleeping places, feeding troughs, etc., it is a wonder that so many hogs survive the ordeal during these hot months. Thousands of hogs never receive any fresh cool water during weeks of hot weather, when they should have an abundance daily.

CAUSES OF HOG CHOLERA AND SWINE PLAUGE.

As was stated in the last report of the Commission, the result of past experiments show that the germs of hog cholera find their way into the bodies of swine with the food and drink, by infection, through sores and flesh wounds, and by inspired air; while those of swine plague are taken almost entirely with the air and through the lungs. Hog cholera germs are very hardy and vigorous. They are able to live for a long time and multiply in the water of ponds and streams. They may live in the soil for at least three months, and in accumulations of straw and litter for a much longer time. They withstand drying and other adverse conditions in a remarkable manner; and will survive in a frozen state for two or three months. The two diseases are sometimes found doing their destructive work together.

CAUSE OF OUTBREAK.

In every instance where definite information could be obtained, outbreaks of hog cholera, or contagious diseases among swine, have been traced to the importation of swine from other states or from infected districts in this State, or from railroads transporting diseased animals. When the germ is once planted and the disease makes its appearance in a herd, its spread to other herds in the vicinity can only be prevented by exercising and enforcing the most careful and rigid measures. The disease may be carried from herd to herd, and from farm to farm, not only by "flesh devouring animals, birds and insects," but by water courses, through drain tile, heavy showers washing under fences and across enclosures, and on the wheels of vehicles and feet of persons and animals.

SYMPTOMS.

The symptoms of hog cholera are so varied, according to conditions of the disease, that it would be almost impossible to give a description that would positively identify the disease in every instance. Therefore it would be well for every farmer, when he notices anything unusual in his swine, such as loss of appetite, diarrhea, or dullness and indisposition to come to the feed trough, or leave their sleeping quarters, to take the precautions necessary to control an outbreak of hog cholera.

SUGGESTIONS AND PRECAUTIONS.

If the farmers of Michigan who raise swine can be induced to generally adopt better sanitary precautions and improve the environments of their swine yards and pens, especially during the summer months, we are confident that the annual losses from swine plague and hog cholera may be ultimately reduced to a minimum each season, and save many thousands of dollars, that are annually lost to Michigan swine raisers.

The best plan is to prevent an outbreak if possible, even though the disease is ravaging in the neighborhood. First, weed out all "runts," leaving only well developed pigs in the herd. Frequently clean out all pens, yards, sleeping places and troughs. If you have an old swill barrel or tub that has stood over from last season knock it to pieces and burn it. It is too true that the average swill barrel stands in "a hole in the ground" for several seasons without a single thorough cleaning or disinfection.

Frequently clean out and disinfect with plenty of fresh lime in solution of one-half pound of lime to one gallon of water. From one to two ounces of crude carbolic acid may be added. Use a sprinkling can or spray pump and thoroughly saturate all places liable to be infected.

Furnish plenty of pure, fresh water every day to each animal from now until late in the fall. See that plenty of shade is available during hot weather. Feed liberally and make each pig grow every day from birth. Furnish charcoal, salt, ashes, burnt cobs, either singly or in combination.

The government formula is as follows:

Wood charcoal	1	pound.
Sulphur	1	"
Sodium sulphate	1	"
Antimony sulphide	1	"
Sodium bicarbonate	2	pounds.
Sodium chloride	2	"
Sodium hyposulphite	2	"

These ingredients should be completely pulverized and thoroughly mixed.

Dose, one large tablespoonful of the mixture once a day for each 200 pounds weight of the hogs to be treated. The medicine should be given in soft feed, as corn meal or ground oats, or crushed wheat, mixed with bran or middlings well moistened with hot water.

A well developed pig, with a strong constitution, is far better able to resist the attack and evasion of swine plague germs, than is the pig that has a weakened constitution, and is forced to live, eat and drink in filthy, germ-laden quarters, with no shade or fresh water furnished daily. Under such conditions, the "survival of the fittest" frequently leaves nothing but the hog pen after the scourge is over.

Every swine owner should keep sharp watch, and, whenever the disease appears, remove the healthy swine from the pen where the outbreak occurs. Do this every time, putting the healthy hogs into new, clean and dry quarters, well disinfected. Never remove sick pigs from a pen, leaving a healthy one instead, to in turn become infected. Keep the two lots of pigs entirely separated, so that no animal or vehicle can pass from one pen to the other.

One important fact to be borne in mind is the fruitful source of the spread of contagion by the visit of one neighbor to another in order to view the sick swine. No owner of swine should take any chances of infecting his herd in this manner. Whenevr it is necessary to enter the enclosure of the sick animals it would be well to put on rubbers, and cleanse and disinfect them before coming in contact with any healthy swine or their feeding places. Another factor in the spread of the disease is the prowling about of dogs, digging up and eating portions of the dead animals, consequently all dogs in the neighborhood, where hog cholera exists, should be kept tied up and not allowed to roam at large. All dead animals should be immediately burned or buried deeply. Very sick pigs had better be destroyed at once. When the disease appears, heroic measures must be resorted to at once by the swine owner, and he should immediately notify the supervisor of the township, and a member of the State Live Stock Sanitary Commission.

TO SUPERVISORS.

Whenever you hear of an outbreak of swine plague or hog cholera in your township, you should proceed at once to investigate, and should such investigation show that an animal is affected you should notify all owners of swine in the neighborhood, and your local board of health should order a rigid quarantine of each and every affected herd. You should also notify a member of this Commission of the outbreak, location, and the action taken by you. The Commission will assist—by personal visit, if necessary—and take such action as the case may require to prevent further spread of the contagion.

Before closing this report, we wish to call your attention to the State Veterinarian's report included in this pamphlet, and which we believe to be worthy of your consideration. As the period covered by this report includes part of the term of office of two officials, their reports will be attached separately, each covering the period for which he served, all of which is respectfully submitted.

H. H. HINDS,
President.
COMFORT TYLER,
Secretary.
JOHN McKAY.

Dated, Lansing, Mich., Jan. 15, 1903.

REPORT OF STATE VETERINARIAN DUNPHY.

Quincy, Mich., Sept. 1, 1901.

Hon. H. H. Hinds, President State Live Stock Sanitary Commission:

Sir—I have the honor to submit the following report of the work of the State Veterinarian, under the direction of your honorable Commission from January 1 of the present year up to this date.

In serving the State as veterinarian, there are pleasant experiences in which the veterinarian is looked upon as a real benefactor, and many instances where he appears in the form of a destroyer, bringing upon himself and the Commission the displeasure of the people whom they seek to benefit. In a majority of cases the owner of diseased animals welcomes the Commission and veterinarian as agents to serve his best interests, and to rescue him from the power of contagion, but occasionally they are treated as unwelcome guests and receive curses instead of blessings, which treatment it becomes officers of the State to overlook, knowing that it is lack of knowledge on the part of the owner that causes the trouble, because he cannot see where he is to be benefited, but when it is the other fellow's horse or cow that is condemned he never fails to see the benefit to himself in the protection of his animals.

To be a member of a Live Stock Sanitary Commission or State Veterinarian, a person must needs possess a virtue often found lacking in the owners of diseased animals, viz.: charity, as it is often necessary to offer a great many explanations, and to counsel with the owner at considerable length until he sees the matter in a proper light; and submits to the great principle upon which all sanitary laws are enacted, the greatest good to the greatest number.

During the period that has elapsed since my last report, I have been called, by direction of your honorable Commission, to a number of different counties in the State, in connection with reports of the existence of contagious diseases, and frequently find that the complaints sent to the Commission are well founded, and active sanitary precautions absolutely necessary, but happily, in many instances, what appears to the farmer or stock owner as a dangerous form of contagious disease, turns out to be only an aggrevated form of some of the common epizootic diseases, due to local causes, such as exposure, or unsanitary surroundings.

Among the principle diseases to which my attention has been called might be mentioned tuberculosis in cattle, glanders in the horse, hog cholera, swine plague and rabies.

As the nature, symptoms and general character of these various diseases have been fully set forth in the reports of the State Veterinarians in the past, with the exception of rabies, and as my attention was called to more cases of this frightful malady during the last nine months than in the previous four years of the time that I occupied the position of State Veterinarian, I deem it prudent to call the attention of the public, through your honorable Commission, to this disease, believing that, according to the experience of other countries, each succeeding year will see an increase of its ravages, unless the most radical measures are taken for its suppression.

Rabies may be defined to be a disease affecting principally the nervous system, shown by restlessness, irritability, fury, paralysis and death, caused by the bite of an animal similarily affected; communicable by inoculation with the saliva from an affected subject; having a long period of incubation, from two to six weeks. This disease must be considered only from the contagious standpoint, as the theory of spontaneous generation of rabies is unworthy of consideration, and should be relagated back to the days of hollow horn, and wolfe in the tail, of cattle. Strange to say, many eminent men in the past have believed in the theory of spontaneous generation of rabies, but those same men held that tuberculosis, pleura-pneumonia and glanders, originated spontaneously; but how rapidly has belief in the origin of these diseases in the absence of contagion died out, since the discovery of the true nature of contagion. Who, today, that has given any thought to this subject, believes in the spontaneous origin of tuberculosis, pleura-pneumonia or glanders. We know positively that these diseases are due to parasites of the nature of bacteria, that must first find their way into the animal, before the disease, of which they are the germ or seed, can develop. That the same is true of the contagion of rabies follows from analogy, and is confirmed by the failure of the disease to develop in Sweden and Norway since its eradication from these countries.

More recently we have seen the disease in Great Britain reduced from between six and seven hundred cases per year, to about a quarter of a hundred, by a few years of intelligent and systematic repression. Surely this result could not have been attained if the disease originated spontaneously.

There is no direct evidence in favor of the spontaneous generation of rabies; investigators who have tried from time to time to produce it by keeping dogs under the conditions which were said to cause it, have uniformly failed.

The tendency of modern thought, and modern knowledge, based upon the most careful experiments, is unfavorable to this hypothesis, and is now regarded as unworthy of serious consideration in the absence of any direct or convincing evidence. From the time of Aristotle (322 B. C.) until the present day, we have clear accounts of this disease existing through every age, and provoking fear and horror in every country where it existed. It was always credited to the bite of some animal, which animal was invariably alleged to be rabid.

Scientific investigation and experiments have clearly demonstrated that rabies is an acute specific disease, due to a specific cause, a virus almost certain, a living germ or elaborated by a living germ, that is transmitted by inoculation only. This process, when it is accomplished, is brought about almost without exception by an animal which is suffering from the disease, conveying to the wound inflicted by his teeth, either upon another animal or upon man, saliva which contains the virus. It is possible that the virus may be conveyed to a wound on man or beast without the subject having been bitten, as the virus has been found to exist in the salivary glands, the saliva, the mammary glands, and the milk, the pancreas, lachrymal glands, and supra-renals, while its absence is noted in the liver, spleen, kidneys, blood, and the muscular tissues, consequently it is of the utmost importance that the public should be warned of the danger of handling animals that are supposed to have died of rabies, if they have any wounds or even slight abrasions of the skin that might come in contact with the saliva.

Experiments were carried out in 1841 and 1842, in the Veterinary School of Lyons, France. A ram was bitten on the nose and foot by a dog that was brought to the hospital affected with rabies. In thirteen days the animal showed the first symptoms of the disease, and the following day became furious when approached, and died on the fourth day. Two days before its death experiments were made with two other sheep. One had the lips rubbed several times against those of the affected animal, and the other was inoculated in the nose and upper lip by punctures of a lancet charged with saliva. The former did not contract the disease. The latter was first affected thirty-eight days after the inoculation. The symptoms were identical with those of the first ram, and resulted in death. Hundreds of experiments have demonstrated that the saliva from any animal affected with rabies will invariably produce the disease when inoculated into another animal.

SYMPTOMS.

The symptoms of rabies are not always as clear and distinct as described in the text-books upon such subjects. The disease is usually marked by three different stages. We have first the pro-dromoal symptoms, second the furious symptoms, or those of the attack proper, third the paralytic symptoms, or those of the final stage. The symptoms of the two first stages, in some cases, may be so slight as to escape notice, but still there exists the paralytic form of the disease. In man, the pro-dromoal symptoms are indisposition, dread and sleeplessness. The attack is assured in by difficulty in swallowing, particularily liquids, which is due to spasm of the muscles of the pharynx. The spasms soon extend so as to involve the muscles of the neck, and later those of the body and limbs. Any attempt at swallowing at this stage is sufficient to bring on a violent attack of general convulsions. It is stated that even the sight of liquids at this peculiar stage, although the animal seems to have intense thirst, will frequently bring on convulsive attacks. It is this peculiar and characteristic stage of the disease that has given rise to the term hydrophobia. Those who have witnessed this form of the disease in man have characterized it as being of the most terrible nature, and the sufferings of the patient as being beyond description. A change in disposition, particularly signs of irritation upon being disturbed either by persons, or other dogs, is characteristic of the first stage of the disease in the dog. As the disease progresses, the dog's voice becomes affected, owing to insipient paralysis of the muscles of the larynx, and his bark or howl is said, by those familiar with the disease, to be one of the distinguishing symptoms. The spells becoming more frequent, he is almost sure to wander away from home, attacking every thing that comes in his way, and if he is naturally a vicious dog, he will go out of his way to attack persons or other animals.

There is a mistaken idea among uninformed persons that a rabid dog is afraid of water, but such is not the case, as they will often plunge into streams, in order to quench their intense thirst, and will make desperate efforts to swallow large quantities of water, which, owing to the insipient paralysis of the muscles of the throat and lower jaw, will bring on paroxysms of coughing and convulsions.

If not killed, the dog will frequently return to its home. The paralysis rapidly extends to the muscles of the lower limbs and trunk, involving the diaphragm and other muscles of respiration, and he dies in a short time. In the cat the furious symptoms predominates, and in her attacks she flies at the hands and face; while in the rabbit, the disease is characterized by the paralytic symptoms, especially in the hind limbs. The duration of the disease is generally from four to five days, but in rare cases in the dog it has been known to last eight or ten days. Those well marked symptoms are not always constant. In some cases the general demeanor of the subject is so little altered and the disease progresses so slowly in the infected animal that there is opportunity to do a great deal of harm before he attracts serious attention. It is these cases, that do not show the symptoms, that the rabid dog is generally supposed to present, that are permitted to do the greatest damage.

In the horse, cow, sheep and pig, we have practically little difference in the symptoms from those of the dog, with the exception that these animals do not show the same disposition to roam as the dog, and while cattle and sheep show little if any tendency to bite other animals or man, the horse and the pig are far more dangerous in this respect.

The paralytic stage of the disease, however, is constant in all animals, death usually following these symptoms in from one to three days.

PERIOD OF INCUBATION.

The period of incubation, according to such eminent authorities as Pasteur, Hertwig and Prof. Ray of the Veterinary School of Lyons, France, varies from thirteen days up to twenty-four months. Such variations, Pasteur says, depends not upon the virulence of the virus, but upon the quantity absorbed. It is difficult to form a definite idea in regard to the period of incubation, as each scientist, who has carried on extensive experiments, has fixed the time from his own actual experience. Sir Thomas Watson, of London, Eng., fixed the period in man at from six weeks to three months, although he admits the period may be of much longer duration. He reports a case where six dogs were bitten at the same time; the first one went mad in twenty-three days, and the last of the six in a hundred and eighty-three days.

Dr. Bradford says that the period in man varies from twenty to sixty days, rare after three months, and still more rare after six months. In dogs he fixes the period from fifteen to sixty days, and claims that half the cases occur in less than a month, in cattle from one to three months, in sheep from fifteen to thirty days, and in the horse from fifteen to sixty days.

In my opinion, Dr. Abba, in referring to the dog, has struck the keynote when he claims that the period of incubation is very variable; he says it has been proven to last two hundred and forty-six days, and that the only safe rule is to kill the suspected dog at once. The great point of interest to the public, in regard to this, is that it gives sufficient time for a person that has been bitten by a rabid animal to take the Pasteur treatment, or it may have a tendency to restrain the owner of some dogs, that is suspected of having been bitten by a rabid dog, from releasing him until all danger has passed.

CONTROL AND ERADICATION OF RABIES.

Experiments in some of the European countries have demonstrated that this dreaded disease can be controlled by active measures on the part of those who have the power in their hands to adopt the most radical measures in regard to its suppression, and when we consider for a moment the extreme suffering of the unfortunate victim of this terrible disease, we must naturally feel that no measures, however radical, if consistent with the laws of the State, can be otherwise than justifiable, in our endeavors to stamp out an outbreak of rabies.

Complaints of suspected cases of this disease require more than an ordinary investigation, from the fact that the history of such cases and the symptoms shown by the suspected animal, varies so much, as related to the members of the Commission, by the different parties interested. The writer can now call to mind an instance in the eastern part of the State, where the people of the village, where the rabid dog was reported, seemed to be divided into two factions; the one claiming that the dog in question showed unusual actions, while the other faction contended that he was only pursuing his usual course.

However, as a number of dogs had been bitten, the member of the Commission making the investigation, deemed it necessary to have a laboratory test made, and secured the head of the dog, which had been killed the day previous, and forwarded it to the experiment station at the Agricultural College, where inoculations on rabbits showed conclusively that it was a clear case of rabies. We also secured a dog that had been bitten by this same subject, just three days previous, which we found in the parlor, in the midst of the family, the idol of the father and his daughters. I had this dog securely muzzled and brought him home with me, and placed him in a cage where he could do no harm, had him carefully fed and watered, and on the fourteenth day after he was known to have been bitten, he showed unmistakable symptoms of rabies, and died four days later. Had this dog not been secured, he might have done an unlimited amount of damage before the laboratory test had time to have demonstrated to a certainty that the dog first complained of was afflicted with rabies.

In view of the fact that in every country where active measures for its suppression have been allowed to relapse for a time, rabies have invariably been known to increase. In support of this contention, I beg leave to quote an extract from a paper, read by Prof. Fleming before the Seventh International Congress of Hygiene and Demography, London, August 10. 1891. The value of the muzzle in suppressing rabies has been perhaps best demonstrated in London on several occasion, and especially in 1885. In the previous years, hydrophobia had increased to a very alarming extent, as has just been mentioned, in England, and no steps worthy of note had been taken to check the mortality. For London alone, no fewer than twenety-seven deaths were reported as due to the bites of rabid dogs. A Muzzling Order was then enforced, and at the end of 1886 not a single death was recorded. Unfortunately, the order prescribing the use of the muzzle was then rescinded, and in a few months a case of hydrophobia occurred in the south of London, which was soon followed by others, and in 1889, ten deaths were registered. In July of that year the muzzling order was again issued and stringently carried out, and rabies once more disappeared.

In Sweden, where the muzzle, and other radical measures, were put in force, rabies has been unknown for many years, and no deaths from the disease have been known since 1870, although at one time it was a somewhat common disease, from eight to ten persons dying annually.

This being the case, is it not the duty of your honorable Commission, with the assistance of local boards of health, to carry out the most stringent measures within your province, not only for the control of this dreadful disease, but with a view to its ultimate eradication from our State, and if you find that the laws under which you operate are inadequate, then to urge upon the legislature the necessity of enlarging your powers, by enacting such sanitary measures as you deem advisable to carry out the work.

TREATMENT.

Before leaving this subject, allow me to call attention to perhaps the greatest scientific discovery of that great scientist, M. Pasteur, of Paris, France, viz.: The Pasteur Treatment for the Prevention of Hydrophobia. In the year 1885, Pasteur had fully demonstrated the efficacy of this treatment on a large number of dogs.

A boy named Miester, being severely bitten by a rabid dog, the treatment was applied to him, with perfect success, since which time, it has been carried on successfully in hundreds of cases, both in Europe and in our country. To illustrate how phenomenal has been the success of this treatment, we quote from the report of the Chicago Pasteur Institute, in the journal of the American Medical Association for July 29, 1899: Number of patitents treated, 780; of whom only three died.

While the efficacy of this treatment is beyond doubt, it must be borne in mind that it is only a preventive measure, and must be applied during the period of incubation; consequently, there should be no delay on the part of a person that has been bitten, as treatment is of no avail after rabies have developed. Even where there is any doubt in regard to the diagnosis of the disease, it is not safe to wait for the laboratory experiments (which is the only certain method), as that takes from eighteen to twenty days. In the meantime, the symptoms of the disease might have had time to set in, and treatment would be of no avail.

THE PASTEUR TREATMENT.

While the principles of the Pasteur treatment are no doubt well understood by your honorable Commission, a short explanation might not be out of place in this report. This treatment consists in injecting hypodermically into the sub-cutaneous cellular tissue of the abdomen for a number of consecutive days, a certain amount of an emulsion, or extract, of the spinal cord of a rabbit affected with rabies, that have been produced by artificial inoculation, and then definitely fixed by passing it through a certain number of animals, the spinal cord is then taken and dried, from one to fourteen days, in a jar containing caustic soda, which process causes it to become attenuated more or less, according to the time of its exposure. After a culture test is made to determine that the cord is free from all pus germs. The technique of the operation consists in taking from two or three C.C. of extract of the cord that has been dried thirteen or fourteen days in the jar of caustic soda, and injecting it into the tissues as described, on the second day an extract from a less attenuated cord is used, i. e., one that has been dried for a less period. This course is kept up for twenty-one days, each day a stronger virus, or one that has been dried for a less period used. For the first to the fifth day, two injections are given daily, after that but one, as the less attenuated extract is used, and especially after about the ninth day a lesser portion of the extract is used. This process is kept up until the cords that have been dried from three to four days are used, and occasionally a cord of two days drying may be used, but a cord of one day's drying is never used.

In closing this report, I wish to call the attention of the public to the following important facts in regard to this matter, viz.: First, that all dogs affected with rabies do not act in the same manner; second, that a dog affected with the disease is not afraid of water, as was generally believed; third, that no measures, however radical, can be too severe, in an endeavor to protect human life from this most dreadful malady; fourth, that the Pasteur treatment is a sure preventive, but must be taken in time, before the symptoms of the disease makes its appearance.

In preparing this report, I have reviewed a great deal of the literature of this important subject, and am indebted to the Journal of American Medical Association, London Lancet, and Woods Medical & Surgical Monographs, for valuable data and statistics in regard to this disease.

In closing this report, and retiring from the position of State Veterinarian, I wish to express my sincere thanks to the several members of the Commission, for the kind and courteous treatment they have always given me while attending to my duties under their direction, and hope that their untiring efforts in looking after the live stock sanitary interests of the State, may keep our State in the front rank of this greatest of all live stock countries, as I believe we are second to no state in the Union today in the sanitary conditions of our live stock.

I wish also to express my gratitude to the members of the veterinary profession throughout the State, for their valuable assistance and cooperation in every instance where their services were required.

I wish also to acknowldge my indebtedness to Prof. Chas. Marshall, of the experiment station, Agricultural College, for the generous assistance always rendered when the services of the bacteriologist were required, especially in the diagnosis of rabies.

All of which is respectfully submited.

GEO W. DUNPHY,
State Veterinarian.

REPORT OF STATE VETERINARIAN WELLS.

Hon. H. H. Hinds, President Michigan Live Stock Sanitary Commission:

Sir—I herewith beg leave to submit the ninth biennial report of the State Veterinarian.

I received my appointment to the office of State Veterinarian September the fourth, 1901. During the sixteen months that I have held the office I have been called upon by your Commission to visit several localities of the State to examine farm stock, when the owners feared they had cases of contagious diseases, as might be expected some of these cases proved to be non-contagious. With my limited knowledge I should say that during my occupancy of the office the live stock of the State had been in a very healthy condition, or else we have not come in contact with all of the cases in the State, and I think the latter is true, and here let me say that I think our law is at fault in this particular, and I believe the members of the Commission will agree with me. If the Commission was allowed to pay one-half or two-thirds of the value of all farm stock condemned, I think there would be more cases reported. Not that I wish to carry the idea that the farmer wishes to be dishonest in this matter, but when he has a suspicion that he has a contagious disease in his flock, and if he reports and his suspicions are confirmed, he is going to lose a portion if not all of his stock, he is very apt to wait longer and take longer chances before he reports his case to the Commission. When an animal is condemned, it is not only a benefit to the owner but to the entire neighborhood in which the owner lives, and on that account I think the State should reimburse him for a portion of his loss. Many of the states of the Union have such laws. Among them I might mention Maryland, Massachusetts, Montana, New Hampshire, New Jersey, New Mexico and New York. From what information I have gained on this subject, this law in these states that I have mentioned gives general satisfaction.

DISEASE OF HORSES.—GLANDERS.

I have been called upon to examine a number of suspected cases of glanders and have found eight head that had this disease. Of these, three cases were so well developed that a test was unnecessary. A farmer reported seven head of horses that had been exposed, and when the mallien test was applied, five out of the seven reacted to the test and were condemned. It might be of some interest to the readers of this report to have a short explanation made of what the mallein test is. Mallien is a product of the bacillus glanders or farcy, a disease that horses and asses are susceptible to. It resembles tuberculin in being a diagnostic agent, and is not a cure for the disease

The great value of mallien is that with it we are able to detect the presence of glanders before there are any outward manifestations of it, and by its use cut short the spread of the disease; but if a horse that had been exposed to the malady was allowed to mingle with others until the disease developed sufficiently to enable us to detect it by other means, the disease would have a very much greater chance to be spread.

MALADIE DU COIT.

At the request of the Commission, and in company with them, I examined a number of horses in Barry county that had been reported to the Commission by the United States Bureau of Animal Industry. Some of these horses had been brought from a quarantined district in one of the western states. Among these horses we found several well developed cases of a contagious disease known as maladie du coit. As this disease is very seldom seen in this State, we will give a brief description of it. Maladie du coit is merely expressive of the fact that it is contracted during copulation. The local symptoms in the mare are first a swelling of the lips of the vulva. This may augment and diminish alternately or one side may swell. The swelling is apt to extend to the anus and down to the mammary glands. The mucus membrane of the vagina becomes studded with bluish or yellow colored spots, and pustules begin to form. The discharge from the vagina is thick and of a whitish yellow color, and collects around the viginal orifice and on the tail, and has a disagreeable odor. On the inside of the thighs may be seen pustules. The animal urinates often, and this causes a good deal of irritation.

Mares generally abort, or if they carry their foal for the full period, the foal is generally dead at birth, or soon after.

In the stallion the symptoms may remain latent for a long time, but he may still convey the disease to a mare. The first symptoms to be seen is a swelling of the sheath, it may extend in front to the sternum and back to the scrotum. When the penis is protruded it may present no alteration, or it may be covered with spots of a violet color. After urine is expelled, the animal stamps violently as if it caused much pain. After the disease becomes further advanced, there is apt to be a discharge of sticky yellow matter from the nostrils. All mucus membranes that can be seen are highly injected. While the appetite may remain good the animal falls off in flesh and a slight pressure on the hips may bring the animal to the ground. When caused to walk, the gait is uncertain. In the last stages of the disease the hind extremities becomes paralyzed. This disease may run for months and even years before death relieves the sufferer.

The only effectual way to eradicate the disease is to castrate the stallions and destroy the mares. A stallion that is used for breeding purposes, that is affected with maladie du coit, can convey the disease to a great number of mares in one season, and in so doing destroy thousands of dollars worth of valuable property.

DISEASES OF CATTLE.—TUBERCULOSIS.

During the past sixteen months I have been called upon from thirteen different localities of the State to apply the tuberculin test, and have tested three hundred and thirty-five head of cattle, and am pleased to say that out of that number none have been condemned. At one point, out of a large herd that we tested in April, 1902, two cows showed very mild reactions. These cows were placed in quarantine, and in October of the same year one of these cows was retested and gave no reaction. At the time this cow was tested, her mate that was held in quarantine with her was due to calve in a few days and could not be retested at that time. The cow did badly after calving, and eight weeks later died. The post mortem revealed a marked case of tuberculosis, complicated with pneumonia troubles, which later complication was undoubtedly the cause of her immediate death.

This is a very good showing for the healthfulness of our herds, and to some it might indicate that our State was free from the disease; but there is no doubt but what there are many cases scattered over the State that have not been reported. And here I cannot refrain from repeating, let the legislature amend our present law so that the Commission can reimburse the farmer for a portion of his loss, and in our opinion it would be but a few years until our State would be free from this dreaded disease.

CONTAGIOUS OPHTHALMIA.

The high price of beef cattle for the past few years has induced the farmers of the State to resort to the western markets for a supply of young stock in these markets. They have not only purchased large numbers of animals, but in many cases they have purchased a very troublesome disease, known as contagious ophthalmia. This disease has affected herds in all parts of the State, and in some localities has been the cause of quite heavy losses to stock owners.

The disease is described in the eighth biennial report of the State Veterinarian. In this report, my worthy predecessor, Doctor George W. Dunphy, has given the readers of his report a very good description of the disease. I might say that it is an affection of the eyes. In many cases the disease is found in such a mild form that it is hardly noticeable, while in other herds it will be found in a very malignant form. In some cases an animal will loose one or both eyes, and in some the animal will loose flesh until it is a mere skeleton, and I have known a few cases where stock owners have lost several head from this disease. From my knowledge of this malady, I should say that it has proved more fatal among our domestic cattle than with the westerners.

With proper treatment and rigid quarantining, it is soon stamped out. But with every fresh importation of western cattle we are liable to have another outbreak. But so far the disease has not proved serious enough to justify a quarantine against western cattle, and it is found scattered over most of the western states, so that if we should quarantine against it we would have to forbid the shipment into the State of cattle from all western states.

ACTINOMYCOSIS.

Actinomycosis, or lumpy jaw, is a diseased condition of upper or lower jaw, the tongue, or in fact the tumors may be found on all parts of the body, internal as well as external. The cause is attributed to the presence of a vegetable parasite, the actinomyces or ray fungus, a star-like vegetable parasitic growth. The parasitic growth is found on grasses and grains and is taken into the mouth of the animal and finds an abode there or in the alimentary canal. During the past year I have met with but few cases of this disease; in fact, I have only been called upon to examine the cases. By referring to the last biennial report, we see the disease spoken of as being very prevalent. I attribute the disease in the number of cases to the fact that the veterinarian of the present is able to cure a large proportion of the cases if taken in the early stages of the disease.

SYMPTOMATIC ANTHRAX.

Symptomatic anthrax, or black leg, has not been prevalent in this State during the past twelve months. I have been called on to visit a few farms when the owner described a disease that his young cattle had had that I should judge was symptomatic anthrax; but at the time of my visit none were sick, and by changing pastures no more loss was met with. But I have met with two herds that I am certain were affected with the disease—one in Allegan and the other in Aranac counties. In both cases the owners had met with quite a loss in young cattle before the disease was reported to your Commission. I held post mortems in both of these cases, and sent material from both to Prof. C. E. Marshall at the Agricultural College, who experimented with it, and in both cases pronounced it symptomatic anthrax. In both of these cases I advised a change of pasture or rough feed and the application of the preventive vaccine, and there has been no further deaths from the disease that I have heard of. This disease is generally confined to cattle under two years of age. The symptoms are loss of appetite, rumination is suspended, the body is alternately hot and cold, the animal is tender to pressure on the back, the gait becomes staggering and the animal is rapidly exhausted. The animal remains in a recumbent position most of the time. When standing the back is arched and the legs stiff, but the standing position is not long maintained. The subject, without much effort, expels bloody matter by the anus. The heart beats very rapidly. The mouth is filled with mucus, blood escapes from the nose, the eyes are sunken and tears flow over the cheeks. Gasses form under the skin so as to become crepitous to the touch along the back and sides. In some cases the animal becomes so excited that it is not safe to go near it. They generally last from six to twenty-four hours.

VARIOLA VACCINAE OR COW-POX.

This disease often occurs in such a mild form that little attention is given it, but in some cases it becomes very severe, and in one case, that my attention was called to a year ago, in Hillsdale county, a stock owner lost several very valuable cows. In this particular case his cattle had mammitis or garget accompany the first disease. Now all of the scientists on the American continent could not induce this gentleman to believe that he garget was not contagious, although he had some cases where garget did not accompany the cow-pox, but he was confident that both diseases were contagious. We could not induce him to believe that the cause of the garget come from his not being able to milk these cows out clean. He was conscientious in his belief, and was sure that he had always milked every drop of milk from them.

The symptoms of this disease is more or less fever, a decrease in the amount of milk, the appetite is impaired, an eruption forms on the udder, it appears as a blister and a yellowish colored fluid oozes out. The vesicles are ruptured by the hands of the milker and in this way the disease is conveyed to the rest of the herd. As there is always a decided rise in the temperature of the animal affected, the milk cannot be considered fit for consumption.

MALIGNANT CATARRHAL FEVER.

This disease, while it is not common in this State, has been the means of quite a loss in a few localities.

The following description was given me by a gentleman who lost a number of animals by this disease. The first symptoms are loss of appetite, rigors, a watery discharge from the eyes, a very profuse discharge of mucus from the nostrils of a yellowish white color. This discharge blisters the nose wherever it comes in contact with the skin. After giving a laxative, the hair falls out wherever the feces comes in contact with the skin. Very high fever, from one hundred and five to one hundred and seven degrees, and it seems to be confined to the head and shoulders. The animal only lives about forty-eight hours after the disease shows itself. I have only been able to hold a post mortem on one animal that I thought was affected with the disease. In this subject the organs were all normal, except the brain and spinal cord, and they were very much inflamed, as well as the mucus membranes of the head and nasal chambers. If the animal lingers for a few days, which they sometimes do, the heart and lungs becomes affected. By medical treatment the life of the animal is sometimes prolonged for a few days or even for a week or two, but they generally succumb to the disease. The only thing to do in an outbreak of this disease is to isolate the sick animals as soon as detected and place the healthy ones in as comfortable quarters as possible and feed well on food easily digested, but nourishing, as an animal in a thrifty condition is not as susceptible to disease as one in an unthrifty condition.

SWINE PLAGUE AND HOG CHOLERA.

These diseases have been prevalent in the State for a great many years, and the past year has not been an exception; and today it is prevalent in a great number of places in the State, and I regret to say that from the present outlook it is liable to continue to spread. And no one is more to blame than the owners. And to illustrate this, I will say that we were called to examine some hogs on a farm in the month of November last that were diseased. On examination, we found a dozen or more cases of hog cholera. We informed the owners of our finding, and told them not to allow anyone to come into their hog yard, nor for them to go near any of their neighbor's hog yards, for in that way they could carry the disease. I was then informed that seven farmers had been in that morning looking the hogs over, and no doubt the first thing they did when they went home was to make a careful examination of their own hogs to see if they could find any similar symptoms.

The symptoms of the two diseases, which are closely allied, have been described in almost every biennial report that has been issued by the Commission, and it would only be a waste of time to repeat this description. I will say here that if the farmers would make a greater effort to stamp out the disease it would be for their own benefit, as it would be hundreds of dollars in their pockets. The loss from these two diseases is tenfold greater in the State than from any other disease that affects live stock.

Some of the means by which these disease germs may be spread:

These maladies affect the intestinal canal, and, of course, the feces contains the germs capable of producing the disease in other animals. It is easy to see that hogs confined in the same pen with diseased ones can contract the disease, but it often happens that hogs on an adjoining farm may acquire the malady. In such cases the germs do not travel through the air, but are carried by such agents as dogs, small vermin, crows and other carrion eating birds, and more often by man himself.

If diseased hogs have access to running streams of water they will pollute the streams and carry the disease to farm lower down on the streams. Often the disease is introduced through the purchase of animals from infected localities, or by exhibiting stock at fairs. Railroad stock cars very frequently serve to spread the disease.

What should be done in case of an outbreak:

It does not follow that all deaths of swine are due to contagious diseases; still the loss of a number of animals should lead one to a very careful examination to find out, if possible, the nature of the disease. In times of cholera outbreaks it is well to consider all deaths of swine as possibly caused by contagious diseases, and act accordingly.

The first thing to be done is to remove all healthy from diseased animals. There is some danger of animals developing the disease after removal if they have been exposed, but if such are separated when the disease first shows itself, little danger need be apprehended. All affected animals should be cared for by one person, and no dogs or other animals allowed near the hog yard. As soon as an animal dies it should be disposed of in a way so as to prevent the spread of the disease as much as possible. This should be done by burning the bodies, if possible, or by burying them deeply, not less than four feet deep, so that the dogs cannot dig them up and carry the contagion. Infected pens and yards should be sprinkled with a solution of crude carbolic acid, or some other good disinfectant. It is well to scatter lime around the pens. This is cheap, and can be used freely. If there are board floors in the pens, it is well to remove them and disinfect under them, and disinfect the boards while up. If a dirt floor, remove the surface for two or three inches with all litter and bury it.

The cholera bacillus can retain its vitality in the soil for a number of months. It is not wise to allow a fresh lot of hogs to occupy infected pens or yards for several months, unless the disinfecting process has been very thoroughly performed.

In closing, I wish to thank the veterinarians of the State and the stock owners for the very courteous treatment that I have received at their hands while performing my duties as State Veterinarian. And I also wish to extend the same to Prof. Charles E. Marshall of the Agricultural College for the assistance he has so cheerfully given me.

Yours respectfully,
F. C. WELLS,
State Veterinarian.

TENTH BIENNIAL REPORT

OF THE

LIVE STOCK SANITARY COMMISSION

FOR THE

YEARS 1903 AND 1904

COMPILED BY THE SECRETARY

BY AUTHORITY

LANSING, MICHIGAN
WYNKOOP HALLENBECK CRAWFORD CO., STATE PRINTERS
1905

STATE LIVE STOCK SANITARY COMMISSION.

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STATE VETERINARIAN.

FRANK C. WELLS, D. V. S.,	SALINE, MICHIGAN

HONORABLE FRED M. WARNER, *Governor of Michigan:*

SIR—The Michigan State Live Stock Sanitary Commission have the honor of offering the following report for the biennial period of 1903-1904.

In the years of Michigan's history following the reconstruction period with the commercial and agricultural industries of the State again settling down to a normal business basis, the live stock industry began to assume proportions that were worthy of more than passing note. The small farmer began to cultivate it. The man of large interests, to foster it, and in some cases even the capitalist began to show symptoms of desiring to flirt with this virgin enterprise. Contemporaneous with an era of business observation of this character must come a farther study as to the possibilities, the opportunities, and the enemies of the future prospect. Of the possibilities, they seemed to be immeasurable. The opportunity was at hand and the only enemies seemed to be that of contagious disease, which if ever securing a foot hold in a locality might continue its devastation without let or hindrance, or be scattered broad-cast over the land by careless, ignorant, or vicious owners of diseased animals. Some of the Eastern states had carelessly framed and but partially effective laws looking toward the suppression of the more common maladies. The Western states were complaining of serious invasion of disease among their domestic animals, brought to them from their Eastern neighbors. Prominent agriculturists of national repute were agitating the question of the establishment of a national law to be placed in charge of an established National Bureau, but with all the agitation the progress of domestic animal disease of a contagious and infectious character went steadily on and on and not until the early eighties were effective measures taken looking toward the suppression of the trouble. At that time Glanders among horses and mules had become so alarmingly prevalent that many of the more easily discouraged and pessimistic of our stockmen were readily predicting this branch of the industry was destined to be wiped from the boards and that the nearby future agriculturist was destined to pursue his avocation with the ox of our forefathers for his plow team or perchance resort to the East India custom of the aborigines in stirring the soil by harnessing his wife to the proverbial crooked stick. Again the continued and continual influx of southern cattle into our state that caused Texas or splenic fever to become rampant in every and any community where they might choose to land, became an ever fruitful topic for the danger-scenting, trouble-loving brother who foresaw the speedy annihilation of the bovine species and was already predicting the passing of the gentle milch cow, and that the goat of the Swiss or the Persians must supplant her to produce milk upon which we were to rear our babies or that industry be abandoned. Contagious pleura-pneumonia had for a decade or so been devastating the dairy herds of New York, New Jersey, Pennsylvania, Maryland, and the New England States and individuals from the infected states and in some instances whole migrating herds were slowly but surely spreading this disease westward; it having already gained a considerable foothold in Illinois and some other western states. Again the cattlemen of "many fears" declared in all sincerity that the cattle industry was surely doomed to destruction and at a casual glance it looked as if it might be true and even now in the light of what has been accomplished, it might not be amiss to say that had it not been for the determined and effective efforts of officer and layman along the lines of controlling and suppressing these maladies, the results might readily have been as serious as the most apprehensive might have feared. Michigan had already established many fine flocks of the wool and mutton producers but foot rot from the close environments of the east and scabies from the ever infected western district was causing the nervous shepherd no end of uneasiness and alarm. He, too, was demanding that "something be done." Hog cholera had devastated whole districts of Ohio and Indiana and was even now slowly but surely working its way into Michigan and becoming a menace so serious to the swine breeder that he dare not remain longer oblivious to its presence. This, then, in outline, is the briefly stated history of the condition of affairs a quarter of a century ago, and these very conditions and the dangers there presented to the stock breeding public were directly responsible in bringing about our present effective methods of restriction. The exact history of the matter being covered in our ninth report as concisely, perhaps, as we might be able to do in another effort.

You will pardon our quotations of a few paragraphs:

To recognize a common danger is to establish a common warfare, with the intelligent American citizen. Individual farmers and farmers' organizations began to discuss ways and means. Curative and preventive measures were exploited; the latter was at once conceded to be the only feasible plan. A Commission with power to quarantine, regulate or destroy, as the exigencies of the case might seem to demand, was readily agreed upon. Large bodies move slowly, but usually act wisely. A committee was appointed to draft bills that would embody the necessary principles of prevention. The result was the drafting of two bills. In the year 1884 they were endorsed at their annual meeting by every live stock association of the State, by the Board of Agriculture, the State Agricultural Society, and hundreds of prominent agriculturists and stockmen in all parts of the commonwealth. They were endorsed by both the outgoing and incoming executive officers of the State. The outgoing Governor, Begole, giving it especial attention in his inaugural address, because it could be made especially useful at just this time, owing to the fact that the general government had, by recent act of Congress, established a Bureau of Animal Industry. The bills were passed by the lower house, practically as drafted, and without serious opposition. They also passed the Senate with the notable exception that the horse and sheep were exempted from the operation of the law. This in actual operation was so plainly unjust to the horse and sheep owner of this State that two years later they were restored to their original place in the bill. This, then, is the sanitary law of Michigan, practically without change, as it stands upon the statute books of our State today and under which this Commission operates, and we believe that with slight additional legislation contemplating at least a partial compensation to the owner for animals bred in the State or owned therein for a period of not less than one year, and not considering pedigree or special breeding in fixing value of the stock destroyed under their supervision or direction, Michigan would then have the most complete, protective, efficacious, economical and satisfactory live stock law to be found on any set of statute books in the United States of America today. Why do we make this assertion? Because of the results that have been achieved. Where is our pessimistic brother of the glanders-farcy period? Dead and buried, together with the two or three hundred horses that it was necessary to destroy in order to exterminate this disease. Glanders, today, while appearing occasionally in isolated localities, is no longer feared by the common populace. Where is the splenic fever crank? He, too, is gone, and with him all fear of the disease, as we are today importing and slaughtering thousands upon thousands of beef cattle from the infected districts, but under the established surveillance of this Commission not a dollar's loss from this disease has occurred to the stock owners of Michigan for a dozen years. And pleura pneumonia? Lying directly as we do in the path of the cattle of commerce from West to East, with three of the greatest trunk lines of railroad in existence, traversing the entire breadth of our State, not a case has appeared within our borders since the present law has been in active operation. Foot-rot in sheep is not prevalent, and we do not fear it. Scabies is brought to us occasionally by the importations from the West of the many thousands of feeding sheep, but we can readily control this, and it has not made serious trouble with the native flocks of our commonwealth. Of hog cholera, alone, do we own that we are not masters of the situation, and with the present means at command can only stand with submissive awe in his presence, doff our hat and say, "Please go away, Mr. Cholera; you really must not come here; we do not want you?" When we consider the magnitude of the live stock industry of Michigan, and our relatively small losses from contagious and infectious diseases of a malignant character, while at the same time the expense in supervision being less than that of any other state in the Union, with a single possible exception, having adequate sanitary laws, the ordinary man of affairs may be pardoned for a modest conceit in the conclusion, as the writer concludes, that the framers of the law authorizing the establishment of a live stock sanitary commission, and the simple provisions under which they operate, "builded better than they knew." and the stock owners of Michigan may well felicitate themselves upon the efficacy of the act. Had we the time and disposition, we might offer you a list of statistical evidence as long as the moral law, as impregnable as the rock of ages, and as complete as the system of the universe, in proof of our contention. Modesty forbids; we refrain.

GLANDERS AND FARCY.

Of the diseases affecting the horse with which this Commission has to deal, Glanders and Farcy are the most serious and fatal. That these are one and the same disease with different manifestations is now so universally conceded and generally well known that we shall treat of them under the same head. The nature of this loathsome malady, the cause and manner of the outbreak, and the desperately fatal results following its appearance is so well known that we shall not attempt to take it up in this report. We might say in this connection, however, that should any reader become particularly interested in the study, that the fourth biennial report of this Commission treats more fully of this disease, which subject matter being accompanied by cuts and illustrations of more than passing value, making it, perhaps, the most complete publication pertaining to glanders of any ever offered for gratuitous distribution. Especially interested parties may be supplied with this report free of cost by applying to any member of this Commission.

In handling this disease the Commission have but one policy. It having been proven absolutely incurable in practice and the science of materia medica not as yet even having been able to combat the progress of the disease, it having once obtained a foothold, there seems to be no alternative to waging a relentless and uncompromising war of extermination. During the biennial period the losses of the State have been extremely small. Six head, only, having been destroyed in the two years, none of which were animals of great value even in health. Of these six animals four were horses carrying the brand of the western range, one came in contact and without question of a doubt contracted the disease from that source, while the history of the sixth animal is so obscure that we are unable to trace the fountain head. Again there are in quarantine at this writing the entire horse outfit of a well to do farmer in Kalamazoo county, at least two of which are believed to be affected (the mallein test will be applied to these horses before this work is in print) and this outbreak, if it proves to be one, is traceable to the association of a single animal of the lot with a branded horse that was afterwards destroyed by the order of this Commission. This history teaches us that Michigan is today practically free from glanders among her native horses and that the time is not far distant, if it has *not now arrived*, when the horse breeder and horse owner will demand that he who would bring the range bred horse into our State must first have him examined and passed upon as to his freedom from contagious disease, by the State Veterinarian, the expense of which shall be borne by the owner of the horse before he be allowed to turn him loose upon the unsuspecting public. When this shall have been done it is the opinion of the writer that Glanders will almost cease to be a menace to our commonwealth. Every horse owner should, however, for his own protection and for the protection of the horse interests at large use every precaution and should he have reason to suspect any animal in his possession or under his observation, either call a competent veterinarian at once or report the matter to some member of the State Live Stock Commission. The danger of neglect in this matter was most expensively illustrated a few years ago in Washtenaw county where a single "cheap skate" from the professional "Hoss" trader was allowed to infect his mates who in turn infected their mates until the financial loss reached many hundreds of dollars. That man himself, is easily susceptible to this loathsome malady makes the need for precaution on the part of the horse owning public doubly necessary. Another argument in favor of the inspection of range horses before entering our State is the fact that the first and only invasion of Maladie du Coit and Sarcoptic Mange were due to this source of infection. At the date of writing our last biennial report we then had in charge a band of range horses and numerous native animals that had been allowed to associate with them by virtue of their distribution in Barry, Allegan, and Kalamazoo counties. This matter was followed very closely by the Commission in joint actions with Dr. Green of the Bureau of Animal Industry, resulting in the complete extermination of the malady. In the process of squelching the trouble four infected or possibly infected stallions were castrated and two branded mares were destroyed. In this case had there been thorough inspection of this almost worthless bunch of range mustangs before entering our State the large expense entailed in locating and inspecting these animals would have been saved as well as much worry and annoyance to innocent purchasers. This observation is equally true in the above mentioned invasion of

SARCOPTIC MANGE.

In the fall of 1903 a band of practically valueless animals of the horse kind, burdened with range brands to the extent of their carrying ability were trailed into Jackson county and corralled for sale and distribution, in the vicinity of Hanover. Here they were sold out in singles, pairs or trios according to the gullibility of the victim until sixteen of them were scattered in the locality. Nothing suspicious appearing at that time they were usually housed or yarded with native horses where such were owned or kept on the premises. Not until late winter or early spring was the matter brought to the attention of the Commission. At this time many native horses were suffering in a frightful manner. The Commission went over the entire ground, found the township board ready to take prompt and effective measures and the further progress of the disease was arrested, but not until it had caused the horse owners of that locality many anxious days and nights and large losses in lack of thrift and labor of treatment. Here again an "ounce of prevention would have been worth a pound of cure."

ACTINOMYCOSIS AND TUBERCULOSIS.

While the Commission have been and are taking cognizance of these diseases as contagious and infectious ones of a malignant character, they have made no startling discoveries, neither have we any new theories to exploit. Actinomycosis, while appearing here and there, usually in isolated cases and always receiving attention at the hands of the Commission when reported to them, is not causing any undue alarm. Tuberculosis has never been prevalent in Michigan and we believe we may safely say that not one per cent of the cattle are affected. Inasmuch as existing conditions are on an even plane with recent past experience, we shall take the liberty of quoting a few paragraphs from our ninth biennial report:

ACTINOMYCOSIS.

A decade ago actinomycosis, or lumpy jaw, was exceedingly common in several counties of this State and caused considerable loss to cattle-growers in some localities.

At that period a series of experiments were carried on at the experiment station under the direction of this Commission to learn more about the communicability of the disease. But little was learned from the experiments. In fact, it may be said the results were negative. The disease appeared in a sporadic manner but spread in certain localities with considerable rapidity. It was apparently epidemic or epizootic in the localities referred to. However, it rapidly ran its course and ceased its extensive depredations as mysteriously as it came. From that date to the present isolated cases are appearing in different portions of the State, not attended with serious loss in any locality. The disease when treated in its early stages seems to respond favorably in a large majority of the cases.

The Bureau of Animal Industry, in behalf of the general government, have carried on very extensive experiments for its cure. The manner and mode of treatment are fully set forth in Bulletin No. 2, United States Department of Agriculture, Bureau of Animal Industry, from which we quote:

Treatment.—"The medicine used by the Bureau of Animal Industry in the treatment of actinomycosis, or lumpy jaw, is the iodide of potassium. The dose should never exceed one-quarter dram for every 100 pounds of live weight. The proper dose being from two to three drams, according to the size of the animal and the extent of the disease. This dose may be given once a day for from five to six days, when the animal may show slight symptoms of iodism, viz.: Discharge of thick mucus from the nose and flowing of tears. The animal will become constipated, perhaps, but this may be easily remedied by giving a dose of glauber salts and some bran mash. This will restore the appetite, and two days after the last dose was given the animal be ready for another week's treatment, and so on until a cure is effected. If these precautions are taken no ill effect will result from the treatment, and if properly fed the animal will gain in condition uninfluenced by the medicine. There is, however, a great difference as to the effect of the medicine on different animals, but any farmer who takes an interest in seeing his stock do well will easily perceive when it is best for him to stop and give the animal a rest for two or three days. The medicine is best given dissolved in soft water and given by means of a horn or long necked bottle. One dose of the medicine, say one and one-half to two or three drams, as the case may seem to require, is dissolved in about a pint of water, seize the animal by the nose to hold up the head, and the contents of the bottle is emptied into the mouth without fixing or securing the tongue in any way."

The medicine is not expensive and can be procured at any drug store, and if the farmer has not suitable scales it can be put up in the desired doses by the druggist. A large per cent of the cases treated with this remedy have been reported cured, and the treatment is well worthy of a trial. Our observation with the many cattle we have had under our charge in this State leads us to conclude that many cases may be cured in the early stage of development by the use of the knife.

TUBERCULOSIS.

The subject of tuberculosis, a disease to which the bovine is highly susceptible, is not so easily disposed of. If this disease is to be dealt with in a manner looking to its suppression, additional legislation will be highly essential. This legislation should contemplate remuneration to owners of infected cattle. It should contemplate the proper manner of carrying along breeding animals to protect the young from infection. It should contemplate the inspection of meat of slaughtered animals showing slight lesions of the disease with a view of utilizing such of it as proved to be wholesome. What is known as the tuberculin test as a diagnostic agent in this particular disease is truly wonderful in its accuracy in determining all or nearly all of the infected animals, only occasionally failing to react in case of an animal having lesions of the disease, and seldom reacting in case of an animal not affected. However, it makes no sort of determination of the degree to which an animal is affected. You may have two perfectly typical reactions, or two dozen, if you please, quite as typical. The post mortem will or may disclose that each and every one of these cattle were affected, but you will find all stages or degrees of infection. You will find an animal with its glandular and pulmonary systems terribly, desperately affected. Evidently the diseased brute is daily, probably hourly, throwing off broken up nests of the tubercle bacilli to infect its associates and perhaps even man himself. On the other hand, you will find another animal in the same lot with an equally typical reaction that is fine and sleek and in physical appearance in perfect health. Post mortem may determine that the animal is affected with the disease. But how affected? You may find upon the closest scientific examination that the entire affectation may be a slight lesion of a small gland or two, and the ordinary everyday man of affairs has a perfect right to conclude, as the writer concludes, that this animal, as far as tuberculosis was concerned, had it been removed from further infection except what it had already imbibed, might have lived for a long and useful career and finally died of old age.

BLACK QUARTER OR SYMPTOMATIC ANTHRAX

Has given us very little concern during this period, but a single outbreak having been brought to our notice and in this case such prompt and effective action was taken by the owners of the animals that the actual fatalities were limited to two animals of moderate value. The symptoms of this disease are now so well known and the preventative treatment by that use of Anti-Black leg vaccine so effective that we do not think serious losses will ever again occur from this trouble. This vaccine can be administered by any handy stockman and may be readily procured either from the Bureau of Animal Industry or through the regular channels of the drug trade and no owner of cattle should hesitate to act promptly at the first manifestation of the trouble. That the disease may be readily recognized by the layman who is first brought into its presence we might add that the symptoms of the disease are as follows: Loss of appetite, lack of rumination, animal is staggering in gait, quickly exhausted, and usually tender to the touch along the back, stiffness of the legs when standing, ofttimes with arched back. Eyes usually sunken with copious flow of tears, mouth will likely fill with mucus and blood may run from the nose. Gases will form under the skin in blotches of various sizes along the back and sides from which a crackling sound will emanate whenever the hand is brushed lightly over them. The animal is usually easily excited and ofttimes the mildest animal may become dangerous to approach. Death usually follows in from six to twenty hours after the first symptoms appear. From the third biennial report we quote: "Anthrax is a disease known under different names, among which are black leg, black tongue, black quarter, etc., which include a group of diseases very virulent, malignant and contagious, appearing in different forms externally and internally, and attacking the different species of lower animals and man himself, in an epizootic, enzootic or sporadic manner, according to the influences that produce it, or whether it is got by inoculation; it sometimes arises spontaneously in low, damp, rich pastures and along the banks of overflowed streams, or where ponds have been drained off or dried up, the soil containing a large amount of organic matter. Long continued warm, dry weather forming the emanations of organic matter and miasmatic gases, form its development."

In our ninth biennial report the following statements are made under the head of

A PECULIAR MALADY

In cattle that has, and is, giving us no little uneasiness and concern has made itself obnoxiously prominent in some of the northern counties of the Lower Peninsula, and has been especially fatal in the latitude of Charlevoix, Grand Traverse, Kalkaska, Oceana, Crawford, and Iosco counties. The peculiar and exasperating features of this desperately fatal malady is its ''lack of symptoms.'' It is also no respecter of persons in choosing its victims for attack. The thrifty, growthy, well-bred well-housed, well-cared-for and all-round sportive steer of the wealthy merchant farmer will be attacked and succumb to its ravages as readily as the hump-backed, bare-ribbed cow of the backwoods trapper, whose roof is the blue sky of heaven, whose drink is the melted snow she licks from the rail fence, and whose ration is the browse of the primeval forest. Indeed, our observation of this trouble has been confined very largely to the animal who might seem to be reveling in luxury, to the envy of his less fortunate and covetous neighbor. The post mortem has as yet revealed nothing as to the nature, cause or remedy. The internal organs seem to be perfectly normal, except for the ever present enemic condition that cannot be accounted for. The animal, which, mayhap, is seemingly in perfect condition, suddenly shows loss of appetite, grows thin and ill, literally starving to death in the midst of plenty until he becomes so weak and emaciated that one must needs hold him up to knock him down. The Commission has given much attention and has had many misgivings regarding this malady, but as yet seem to have made little or no headway toward a solution of the problem. We started on the theory that some poisonous weed or herb was doing the mischief, and with this idea in mind induced the experiment station to send a botanist to the trysting place of this mighty little tyrant in Kalkaska county. Prof. Wheeler, a man most skilled in botanical knowledge, made a minute and careful study of the fields and forests in this vicinity for a period of several days, but failed to find a plant of any description which he was willing to accuse of being the wilful murderer of these animals.

Since writing the above article two years have elapsed. The writer and his associates have travelled hundreds of miles by rail and by private conveyance in their efforts to learn something more of this desperately insidious and fatal disease. We have observed and studied it in many counties and on varied soils. Have found it under every condition. Have been able to interest the Michigan Experiment Station to work jointly with us in an effort to find out what we were in the presence of, how it might be prevented or how to successfully combat with it, and we are in all candor compelled to admit that this desperate tyrant is as elusive today as he was the day we first started on his trail. He will entirely devastate one man's herd, may skip a farm, a township, or a county if he pleases, and light down on a group of cattle and spread havoc uncontrolled and uncontrollable. We may say today that it is the only malady of the cattle kingdom that we are unable to check or hinder, or of which we do not feel ourselves masters of the situation. As a matter of fact we do not wish to say whether it is a contagious or infectious disease or whether similar cases are produced by similar causes.

The writer of this article is of the personal opinion that relief when it comes, and we shall not be content to rest our case until it *does* come, will have to come as the result of the direct discoveries of bacteriological research and under such belief hope to be able to pursue the matter in connection with Dr. Marshall's department more fully than ever. The only hope we may offer today, however, is that we have the will to keep trying and not despair.

CONTAGIOUS OPHTHALMIA

Among cattle at the time of our last report was giving the Commission no little concern. Nearly every case where serious consequences followed was brought about by the importation into the State of western cattle, and while the disease did not seem to cause serious results with the cattle so imported when they associated with our native cattle, who in turn contracted the disease the losses, while rarely if ever going to the extent of fatalities, were quite severe in loss of flesh, lack of thrift and apparent difficulty to bring these back to a state of usefulness. Some pressure was brought to bear on the Commission suggesting the complete suppression of this class of importations, but believing that such drastic measures would work an irreparable injury to our feeding industry and furthermore believing that methods of control that would be equally protective could be established, proceeding along the lines of quarantine, isolation and treatment of infected importations with the result that there has been but a single outbreak of native cattle infection brought to our notice for many months. We have found the owners of diseased animals to be uniformly willing and anxious to cooperate with us in the suppression and eradication of the difficulty and to this condition may quite largely be attributed the success of the undertaking. We do not apprehend trouble from this source that may not readily be controlled without serious losses. That the disease may be readily recognized we quote from the report of Dr. Dunphy who was then State Veterinarian as carried in the Eighth Biennial report of this Commission.

In speaking of contagious ophthalmia, Dr. Dunphy says:

This disease consists in more or less violent inflammation of the delicate membrane lining the eyelids and of the transparent tissue which constitutes the cornea or front of the eye-ball. The inflammation in many cases is so intense that it involves all the structures of the eye and in such cases causes adhesions and total blindness. The disease is undoubtedly caused by some micro-organism, although the germ has not yet been positively identified. There is no doubt, however, that it is highly contagious and whatever the causative agent, it seems to be rapidly transmitted from animal to animal, either by direct contact or by contact with infected places, or possibly through the air.

The first symptoms resemble the ordinary simple ophthalmia, consisting of swelling of the eyelids and a congested condition of the conjunctiva, and a flow of tears. In the latter stages a deposit forms between the two coats of the eye, and the cornea becomes white and opaque. The discharge from them becomes more sticky and albuminous as the disease progresses, and assumes the character of a creamy looking pus. The sunlight seems to have a very painful effect on the eye, and the afflicted animals suffer very much to all appearance when exposed to the light, and are inclined to seek dark or shady places that are not exposed to the sun's rays.

I have noticed cases where the cornea had ulcerated and perforation resulted, and the whole contents of the front chamber of the eye had run out, and the eye was completely destroyed. Inquiry into the history of these cases showed that the disease varied in different cases from ten days to three weeks, and I am inclined to believe that with rational treatment, a complete recovery would result unless ulceration of the cornea takes place. The progress of the disease should be checked as quickly as possible by the early isolation of the afflicted cattle, and a thorough disinfection of the premises where they were kept, such as watering troughs or stables if the animals were housed. Animals under treatment should be placed in a darkened stable, and warm water and mild antiseptics and anodynes used. We cannot too strongly condemn the pernicious practice of using such irritants as burned alum or spitting tobacco juice into the eye of the afflicted animals, and I am inclined to believe that some of the disastrous results of the disease in the animals I inspected came from this cruel and filthy treatment.

We are glad to be able to class the author of this report as among the most competent of his profession in this State.

FOOT AND MOUTH DISEASE.

The prevalence of this desperately insidious disease in the New England states a few months ago which gave cause for uneasiness all over the Union, having been fully stamped out of the United States through the prompt, systematic, and effective efforts of the Bureau of Animal Industry, has removed all cause for immediate fear in that direction and therefore hardly requires mention in this report.

RABIES-HYDROPHOBIA.

While the Commission have been called to take active measures in many cases of hydrophobia during the last two years, but few localities have had serious losses. Where the local authorities have taken active measures to restrict the spread of the malady pending the arrival of the Commission it has usually been confined to its initial quarters. The method of handling this difficulty is to rigidly quarantine or securely muzzle every dog in a suspected territory under the supervision of the supervisors of the several townships until such time as the extent of the infection or the absolute correctness of the diagnosis may be positively determined, when every dog known to have been bitten by a rabid canine will be destroyed. It has not been the policy of the Commission to order the destruction of domestic animals, even though known to have been bitten by a supposedly rabid dog, as not all such develop the disease, and should they show symptoms of the malady they may then be destroyed to save them several days of intense suffering, as death is inevitable. While it is no doubt a scientific fact that hydrophobia *may* be contracted by one animal from another and perchance the horse or the pig might infect his neighbor, so also the cow and the sheep could you induce them to inflict an open wound and deposit the saliva therein, the present Commission are ready to say that never in their observation of many hundreds of cases has the disease been conveyed by any other animal than the dog, and we believe him to be the only source of serious danger with the possible exception of the domestic cat, and Tabby, being a nimble lass, is likely to take to the backyard fence or the convenient cherry tree when the rabid dog is abroad, from which vantage ground she spits defiance at her tormentor until he goes his way; thus she is not likely to be bitten; but should she be, then by all means destroy her at once, for her domestic nature and natural tendencies to be the comrade and boon companion of the babies make her a doubly dangerous creature should she become afflicted with the malady. In a supplement to the report of the State Board of Health for 1895, we find the following, which is so exactly applicable, and withal so very sensible, we shall take the liberty of quoting it verbatim, without the permission of Dr. Baker, which permission, we are sure, would be freely and cheerfully granted had we opportunity to seek it.

RULES AND REGULATIONS SHOULD BE FRAMED AND PUBLISHED.

One of the most efficient means employed for the restriction of the spread of rabies is a set of rules which shall regulate the action and movement of animals infected with the disease. Each local board of health should frame and publish (in accordance with the State laws) rules which would enable the health officer to act promptly upon the appearance of a case of this disease so dangerous to the public health and life. If a health officer is obliged to wait until the local board can be called together the disease may have been allowed to spread instead of restricting it to the first case. On the occurrence of a case of rabies the fact should be reported to the local health officer and promptly restricted by him in accordance with act 137, laws of 1883. The health officer should, in compliance with sections 5 and 6, act 125, laws of 1889, report the fact to the Live Stock Sanitary Commission. The local health authorities should isolate the animal or animals and keep them so until they are taken care of by the State Live Stock Commission or State Veterinarian; but under no circumstances should the local health authorities fail to guard the public health and life. Whether in man or animals the full fact regarding the outbreak of the disease should be reported to the secretary of the State Board of Health at Lansing. In the cities the ''dog ordinance" generally regulates the actions of animals most likely to be infected with rabies. Every city should be equipped with an efficient ordinance and should demand its strict enforcement. An ordinance may be ever so efficient, but if not enforced is useless, and the stray and ownerless dogs will be permitted to roam about the cities to become infected with rabies and transmit the disease to human beings. For the restriction of the spread of rabies and hydrophobia, it is important that prompt action should be taken with any suspicious animal. When a dog or other animal acts strangely and there is suspicion of madness, the animal should be immediately confined, not killed, and kept under observation for a week or ten days. Have the animal examined by a competent physician or veterinary surgeon, and if the animal is rabid the characteristic symptoms will soon be observed. Pasteur says the animals will certainly die within eight days. If at the end of that time no symptoms of rabies have been observed the bite cannot cause hydrophobia, and there is no reason why the animal should be destroyed. If symptoms of rabies do appear in the animal thus under observation, it should be immediately killed. And, if the animal has bitten a human being, a small portion of the medulla oblongata should be secured and placed in a small vial containing pure glycerine only, for use in experimental inoculations of other animals to determine without doubt whether the animal suspected of rage was really rabid. If other animals have been bitten by a suspicious animal they should likewise be confined until it is proven whether or not they are rabid, or until the period of incubation has passed. It is quite frequently the case that valuable stock has been bitten by animals not rabid, and it would be a useless destruction of property to destroy such animals. Do not kill an animal unless you have good reason to believe it is rabid, or unless it is a source of danger to other animals and to human life. Of course a dog may run mad when it is quite impossible to secure the dog, and extremely dangerous for it to run at large, where shooting the animal may be the only safe way. In such a case the animal should not be disposed of until it is absolutely certain that no person has been bitten. If a person has been bitten a portion of the medulla should be prepared as described above. If a human being has been bitten and the animal is destroyed there is no other way left to ascertain whether or not the dog was really mad, and whether the person bitten has been inoculated with the virus of this terrible disease.

If precautions as above outlined are taken, we do not think any unusual apprehension need to be felt in regard to rabies.

DISEASES OF SHEEP.

Never, perhaps, in the history of the sheep industry in Michigan has it been more uniformly prosperous or freer from disastrous invasions of contagious diseases than has this biennial period. Nearly every case of fatality has proven on careful examination to have been caused by internal parasites. Parasites are living animal organisms that extract nourishment for their existence from the tissues of their host. In sheep we find that parasites are the cause of many of the most serious diseases. They invade all the organs of the body from the brain to the rectum, their multiplication and resultant damage being in direct proportion to the neglect and bad management on the part of the flock owner. Of all the numerous internal parasites we have to contend with the twisted stomach worm (strongylus contortus) is perhaps the most prevalent and responsible for the most fatalities. The strongylus contortus inhabits the fourth stomach of sheep, and while it does not cause any great disturbance, usually among the adult sheep, we think we are safe in saying that it has been the cause of more financial loss to farmers and flock owners of Michigan in its fatalities among the lambs than all other diseases of the sheep combined. These parasites may be found adhering by their heads to the mucous membrane of the stomach. They are of a reddish color and feed principally, we are told, upon the blood of the animal. These little worms when present in large numbers ofttimes appear like masses of threads from one to one and one-half inches in length. If the animal has been killed for examination the worms may be seen wriggling and squirming in all directions, and the writer has even found them in balls as large a hen's egg. Their presence in large numbers causes great weakness, considerable fever and ofttimes aggravated diarrhea. A dropsical swelling under the chin will usually be seen; the eyes, lips and tongue are very pale; the animal loses appetite, mopes around and is always thirsty, consuming large quantities of water, if able to get it, and contrary to the usual nature of sheep, seem almost to prefer to drink from some filthy pool rather than a clean trough. The blood becomes pale and watery. The parasites develop somewhat slowly and their presence may not be discovered by the indifferent flock master until one or more fatalities have occurred. If you have done nothing until this occurs your losses will be large. Treatment of this disease has so far not been very successful. The gasoline and milk treatment being perhaps as good as anything yet tried. Immunity from severe losses with this disease must then be by prevention. It is the opinion of the writer of this report (the Secretary of the Commission, who is the owner of a flock of pure bred sheep), based upon several years of actual experience, that when our flock owners shall have awakened to the absolute necessity of taking early preventive measures that their losses may be reduced to a minimum. This should commence as soon as the lamb begins to eat. I am satisfied that the time honored biblical phrase, "they that are well need no physician," is not applicable to this case, for in 95 per cent of the cases of strongylus contortus in lambs, "they that are sick" need only the undertaker. We have not found this disease particularly prevalent in any one locality, but have found it creating sad havoc among the lambs in almost every county in the State where sheep are kept.

FOOT ROT.

Since the last biennial report but two cases of foot-rot have been reported to this Commission, and while this is not proof positive that no case now exists in the State, we are of the opinion that no serious outbreaks have occurred. The methods of treatment and the entire elimination of this disease from a flock that may have contracted the disease is now so well known that we do not apprehend that the flock masters of Michigan need have any uneasiness regarding it.

SCAB.

Scab has only been reported to the Commission from a few townships, and while we are of the opinion that there has been other outbreaks than this, the sheep owners have been so fully alive to the necessity of handling it rapidly, thoroughly and well that it has not been the cause of serious difficulty. We do not think the native sheep of Michigan are affected with this disagreeable malady, and where it has been found it has come to us with Western sheep that have been brought in for feeding or other purposes. While this disease, if left to run its course, will cause serious losses, it is not difficult to eradicate. Dipping, dipping, dipping, thorough dipping is the remedy. We would advise very strongly against the use of lime and sulphur dip, as the almost universal testimony of the best sheep men and wool buyers and manufacturers, as well as the personal experience of the writer of this article, is that it is positively very injurious not only to the wool but to the sheep as well. That it will cure scab if used thoroughly enough and hot enough, we do not deny, but that it will also kill the life of the wool, and seriously injure at least fifty per cent of the sheep so dipped, is equally true. There are dozens of good proprietary dips that are fully as efficacious in the curing of scab, and can be used without the attendant risks. The question of cost cuts comparatively no figure with the small Michigan flocks, as the expense for material with any good standard dip is not more than a cent or two per head at most, if dipped with the wool off. Happy is the flock owner who has not yet made the acquaintance of sheep scab, but that he may readily recognize it if it should by chance misfortune invade his flock, we here append a clipping from Bulletin No. 21, U. S. Department of Agriculture, a careful reading of which will make the discovery and diagnosing of the disease a comparatively easy matter, and give the flock master, we hope, as intimate an acquaintance with his majesty "Psoroptes communis" as he may ever be called upon to make.

To recapitulate, let us say the only serious diseases of sheep that are confronting the flock owners of Michigan are foot-rot, scab and internal parasitic diseases. A case of foot-rot in this State is not now known to the Commission. Scab when appearing may be readily and effectually stamped out. But for the dreaded internal parasites that have caused such serious losses to our flock owners during the summer months, until such time as the science of materia medica shall have given us a more efficacious remedy than those we have yet tried, we must wage a continual warfare of prevention if we would save our flocks from its ravages.

DESCRIPTION OF SHEEP SCAB.

COMMON SCAB, BODY SCAB, OR PSOROPTIC SCAB.

Although the symptoms of common scab are familiar to most farmers, they will here be briefly reviewed.

The mites of common, or body scab—that is Psoroptes—prick the skin of the animal to obtain their food and probably insert a poisonous saliva in the wound. There bites are followed by intense itching, with irritation, formation of papules, inflammation, exudation of serum, and the formation of crusts, or scabs, under and near the edge of which the parasites live. As the parasites multiply they seek the more healthy parts, spreading from the edges of the scab already formed, thus extending the disease. The sheep are restless; they scratch and bite themselves, and rub against posts, fences, stones, or against other members of the flock. This irritation is particularly noticeable after the animals have been driven, for the itching is more intense when the sheep becomes heated. The changes in the skin naturally result in a falling of the wool; at first slender "tags" are noticed; the fleece assumes the condition known as "flowering;" it looks tufty or matted, and the sheep pulls out portions with its mouth, or leaves tags on the objects against which it rubs. Scabs fall and are replaced by thicker and more adherent crusts. The skin finanlly becomes more or less bare, parchment-like, greatly thickened, furrowed and bleeding in the cracks. With shorn sheep, especially, a thick, dry, parchment-like crust covers the greatly tumified skin. Ewes may abort or bear weak lambs.

Parts of Body Affected.—When sheep are kept in large numbers the chances for infection are naturally greater, and the disease may begin on almost any part of the body. Generally, however, it affects the parts which are covered with wool. When the sheep are fat and the wool has a large amount of yolk, the progress of the disease may be slow; usually beginning on the upper part of the body, withers and back, it extends slowly but none the less surely, and in ever-increasing areas, to the neck, sides, flanks, rump, etc. In two or three months the entire body may be affected.

Contagion.—Common scab is exceedingly contagious from one sheep to another, and may in some cases show itself within about a week after healthy sheep have been exposed to infection. The contagion may be direct, by contact of one sheep with another; or indirect, from tags of wool, or from fences, posts, etc., against which scabby sheep have rubbed, or from the places where the sheep have been "bedded down." One attack of scab does not protect sheep from later attacks.

Chances of Recovery.—Cases of apparent spontaneous recovery are rare. Usually when proper methods of treatment are not adopted the disease increases, leads to anæmia, emaciation, exhaustion and death, and may result in a loss of from 10 to 80 per cent of the flock. Scab is favored by seasons when the wool is longest, and by huddling or over-crowding the animals; also race, energy, temperament, age, state of health, length, fineness of and abundance of wool, and the hygienic conditions of the surroundings influence the course and termination of the disease. Young, weak, closely inbred animals, and those with long, coarse wool will most quickly succumb. Unhealthy localities, damp climate and poorly ventilated sheds favor the disease. Pure or mixed Merino sheep succumb sooner than certain other breeds. The mortality varies according to conditions, but is highest in autumn and winter. When owners are careless the death rate may be very high; if untreated the sheep may die in two or three months. Hygienic conditions, good food and cool, dry atmosphere tend to check the disease. Sheep sheds should accordingly be well ventilated and open to light and sunshine. With proper attention to hygienic conditions and thorough dipping, a positive cure can be guaranteed.

Vitality of the Parasite.—Taken from the sheep the mites possess a remarkable vitality. It is generally stated that, kept at moderate temperaature on portions of scab, the adults may live from four to twenty days, but they will occasionally live much longer; cases are on record where they have lived three, four, or even six weeks when separated from sheep; if the atmosphere is dry they will generally die in about fifteen days; but death is often only apparent, for the mites may sometimes be revived by warmth and moisture even after six or eight weeks; the fecundated females are especially tenacious of life. Various, rather contradictory statements may be found regarding their resistance to cold. Krogman states that they may live at a temperature of minus 10° C. (+14° F.) for twenty-eight days. Other authors claim that the mites die in two hours at 47° F., still other authors, that they die at 50° C. (122° F.) They are said to have been kept alive in cold water for six days and in warm water for ten days. Several authors admit, however, that the parasites are usually killed by a soaking rain; though it is claimed that in damp, dark stables they ''may live for months."

Experience has shown that in some cases apparently healthy sheep have become infected in places where no sheep have been kept for four, eight, twelve or even twenty-four months. The conditions underlying this infection are not thoroughly understood. Possibly some of the eggs have retained their vitality a long time and then hatched out; possibly the vitality of the fecundated female has also played a role; while it is not at all improbable that an entirely new infection has accidentally been introduced by birds or other animals. Certain authors of high standing scout the idea that birds can introduce an infection of scab, but there is no reason why birds should not do this, and there are some reasons for believing that they do. It has been noticed on the Experiment Station of the Bureau, for instance, that crows delight in perching on the backs of scabby sheep and picking at the scab. While so doing it is only natural that small tags of wool should adhere to their feet, and thus scatter scab. The fact that snails cling to birds' feet and are carried long distances is too well established to need discussion, and it is very probable that many of the cases where sheep are supposed to have become infected with scab on pastures which have not been occupied for one or two years are in reality cases of fresh infection by means of birds. From the data at hand, while it may be admitted that in some cases, under favorable conditions, the mites may live from spring to fall, it is scarcely within the limits of probability that either the scab mites or their eggs will live through a winter when separated from the sheep and exposed to the elements.

All matters connected with the vitality of the scab mite have an important bearing in explaining cases of indirect infection on roads over which scabby sheep have been driven, or in fields and sheds where they have been kept. From the facts now at our disposal we can lay down the following important rules:

(1) Scabby sheep should never be driven upon a public road; (2) sheds in which scabby sheep have been kept should be thoroughly cleaned, disinfected and aired, and should be left unused for at least four weeks (better two months) before clean sheep are placed in them; (3) fields in which scabby sheep have been kept should stand vacant *at least four weeks* (better six or eight) before being used for clean sheep; (4) a drenching rain will frequently serve to disinfect a pasture, but it is well to whitewash the posts against which scabby sheep have rubbed. Even after observing the precautions here given it is not possible to absolutely guarantee that there will be no reinfection, but the probabilities are against it.

Life History of the Parasite.—A study of the life history of the scab parasite is necessary in order to determine several important points of practical value, such as the proper time for the second dipping, etc.

The female mite lays about 15 to 24 eggs on the skin, or fastened to the wool near the skin; a six-legged larva is hatched; these larvæ cast their skin and become mature; the mites pair and the females lay their eggs, after which they die. The exact number of days required for each stage varies somewhat, according to the writings of different authors, a fact which is probably to be explained by individual variation, and by the conditions under which the observations and experiments were made. Thus Gerlach, in his well-known work (1857), estimates about fourteen to fifteen days as the period required for a generation of mites from the time of pairing to the maturity of the next generation. He divides this time as follows: Under ordinary conditions the eggs hatch in three to four days, although two authors allow ten to eleven days for the egg stage; three or four days after birth the six-legged larvæ moult and the fourth pair of legs appears; this fourth pair is always present when the mites are two-thirds the size of the adult; when seven to eight days old the mites are mature and ready to pair; several (three or four) days are allowed for pairing; another generation of eggs may be laid fourteen to fifteen days after the laying of the first generation of eggs. Without going into all of the other observations on these points, it may be remarked that the eggs may not hatch for six or seven days; the six-legged larvæ may moult when three to four days old, and become mature; after pairing a second moult takes place, lasting four to five days; a third moult follows immediately, then eggs are laid and the adults die; in some cases there is a fourth moult, but apparently without any further production of eggs. Accepting Gerlach's estimate of fifteen days as an average for each generation of ten females and five males, in three months' time the sixth generation would appear and consist of about 1,000,000 females and 500,000 males.

Several practical lessons are to be drawn from these figures: First, it is seen that the parasites increase very rapidly, so that if scab is discovered in a flock, the diseased sheep should immediately be isolated; second, if new sheep are placed in a flock, they should either first be dipped, as a precautionary measure, or they should at least be kept separate for several weeks to see whether scab develops; third, since the chances for infection are very great, the entire flock should be treated, even in case scab is found only in one or two animals; fourth, as dipping is not certain to kill the eggs, the sheep should be dipped a second time, the time being selected between the moment of the hatching of eggs and the moment the next generation of eggs is laid. As eggs may hatch between three and seven (possibly ten or eleven) days, and as fourteen to fifteen days are required for the entire cycle, the second dipping should take place after the seventh day, but before the fourteenth day; allowing for individual variation and variation of conditions, the tenth, eleventh or twelfth day will be the best time to repeat the dipping.

IMPORTANCE OF PROPER USE OF DIP.

Whatever dip is selected, the farmer should not forget that there are two ways to use that dip. One way is to prepare and use it in accordance with the directions given; the other way is to attempt to economize time, labor, or money by using the dip in weaker proportion than advised, by hurrying the sheep through the swim, or by later placing the dipped sheep under unfavorable conditions. If the former method is adopted with any of the established dips, the treatment ought to be followed with favorable results; but if the latter method is adopted, the farmer himself must assume the responsibility of failure, no matter which dip he decides to use. Every farmer should therefore remember that when he has decided upon the dip he is to use his work is only begun; to use the dip properly is fully as important as to use a dip at all.

The Pastures.—In case it is necessary to place the dipped sheep on the same pastures they occupied before being dipped, it is always best to use a dip containing sulphur. If a proprietary dip is selected under those circumstances, it is suggested that sulphur be added, about 1 pound of flowers of sulphur to every 6 gallons of dip. In case it is possible to utilize fresh pastures after dipping, the use of sulphur is not so necessary, but it is always advisable. The object in using sulphur is to place in the wool a material which will not evaporate quickly, but will remain there for a longer period of time than scab parasites ordinarily remain alive away from their hosts. By doing this the sheep are protected against reinfection.

HOG CHOLERA AND SWINE PLAGUE.

The ravages of this fatal disease has and is causing more financial loss to the farmer of Michigan at the present time than any and all other contagious diseases of domestic animals combined. The Commission is constantly called upon during the hot summer and fall months by farmers, stockmen, and feeders in nearly all parts of the State to assist in the control of this malady. In all cases the Commission or some member thereof undertake to visit the locality, go over the infected district and assist in every possible way to prevent its farther spread, and in this connection allow us to say that in the opinion of this Commission this disease, hog cholera, swine plague, or whatever you may choose to call it, in its various phases and manifestations, be it correctly named or misnomer; this plague, let us reiterate, is the most serious menace to the farmer of Michigan that he has to confront today. Until such time as the science of materia medica shall exploit some remedy in the form of a curative agent, or antitoxin preventative (and it is in this latter form that the effective treatment will eventually appear, in the opinion of the Commission), until such time, we say, as something not yet exploited or brought to the attention of this Commission we only ask the privilege of fencing him in with a fence so high that the dog of the farm or the neighbor's farm cannot climb it, the chicken crawl under it, or the pesky English sparrow fly through it, and then lay down at the behest of his majesty, hog cholera, swine plague, pneumonia, call it what you please, it kills them anyway. When an outbreak occurs we usually find the farmer ready and willing to adopt heroic measures to save his swine. When we consider the sanitary conditions and surroundings of the yards of many of the places we visit we sometimes are led to wonder that so many hogs survived the ordeal. The Bureau of Animal Industry are constantly employing scientific experts in making research and investigation along the line of prevention and cure but up to and including the present time no very satisfactory results have been attained.

CAUSES OF HOG CHOLERA AND SWINE PLAGUE.

As was stated in the last report of the Commission, the result of past experiments show that the germs of hog cholera find their way into the bodies of swine with the food and drink, by infection, through sores and flesh wounds, and by inspired air; while those of swine plague are taken almost entirely with the air and through the lungs. Hog cholera germs are very hardy and vigorous. They are able to live for a long time and multiply in the water of ponds and streams. They may live in the soil for at least three months, and in accumulations of straw and litter for a much longer time. They withstand drying and other adverse conditions in a remarkable manner; and will survive in a frozen state for two or three months. The two diseases are sometimes found doing their destructive work together.

CAUSE OF OUTBREAK.

In every instance where definite information could be obtained, outbreaks of hog cholera, or contagious diseases among swine, have been traced to the importation of swine from other states or from infected districts in this State, or from railroads transporting diseased animals. When the germ is once planted and the disease makes its appearance in a herd, its spread to other herds in the vicinity can only be prevented by exercising and enforcing the most careful and rigid measures. The disease may be carried from herd to herd, and from farm to farm, not only by "flesh devouring animals, birds and insects," but by water courses, through drain tile, heavy showers washing under fences and across enclosures, and on the wheels of vehicles and feet of persons and animals.

SYMPTOMS.

The symptoms of hog cholera are so varied; according to conditions of the disease that it would be almost impossible to give a description that would positively identify the disease in every instance. Therefore it would be well for every farmer, when he notices anything unusual in his swine, such as loss of appetite, diarrhea, or dullness and indisposition to come to the feed trough, or leave their sleeping quarters, to take the precautions necessary to control an outbreak of hog cholera.

SUGGESTIONS AND PRECAUTIONS.

If the farmers of Michigan who raise swine can be induced to generally adopt better sanitary precautions and improve the environments of their swine yards and pens, especially during the summer months, we are confident that the annual losses from swine plague and hog cholera may be ultimately reduced to a minimum each season, and save many thousands of dollars, that are annually lost to Michigan swine raisers.

The best plan is to prevent an outbreak if possible, even though the disease is ravaging in the neighborhood. First, weed out all "runts," leaving only well developed pigs in the herd. Frequently clean out all pens, yards, sleeping places and troughs. If you have an old swill barrel or tub that has stood over from last season knock it to pieces and burn it. It is too true that the average swill barrel stands in "a hole in the ground" for several seasons without a single thorough cleaning or disinfection.

Frequently clean out and disinfect with plenty of fresh lime in solution of one-half pound of lime to one gallon of water. From one to two ounces of crude carbolic acid may be added. Use a sprinkling can or spray pump and thoroughly saturate all places liable to be infected.

Furnish plenty of pure, fresh water every day to each animal from now until late in the fall. See that plenty of shade is available during hot weather. Feed liberally and make each pig grow every day from birth. Furnish charcoal, salt, ashes, burnt cobs, either singly or in combination.

The government formula is as follows:

Wood charcoal	1 pound.
Sulphur	1 pound.
Sodium sulphate	1 pound.
Antimony sulphide	1 pound.
Sodium bicarbonate	2 pounds.
Sodium chloride	2 pounds.
Sodium hyposulphite	2 pounds.

These ingredients should be completely pulverized and thoroughly mixed.

Dose, one large tablespoonful of the mixture once a day for each 200 pounds weight of the hogs to be treated. The medicine should be given in soft feed, as corn meal or ground oats, or crushed wheat, mixed with bran or middlings well moistened with hot water.

A well developed pig, with a strong constitution, is far better able to resist the attack and evasion of swine plague germs, than is the pig that has a weakened constitution, and is forced to live, eat and drink in filthy, germ-laden quarters, with no shade or fresh water furnished daily. Under such conditions, the "survival of the fittest" frequently leaves nothing but the hog pen after the scourge is over.

Every swine owner should keep sharp watch, and, whenever the disease appears, remove the healthy swine from the pen where the outbreak occurs. Do this every time, putting the healthy hogs into new, clean and dry quarters, well disinfected. Never remove sick pigs from a pen, leaving a healthy one instead, to in turn become infected. Keep the two lots of pigs entirely separated, so that no animal or vehicle can pass from one pen to the other.

One important fact to be borne in mind is the fruitful source of the spread of contagion by the visit of one neighbor to another in order to view the sick swine. No owner of swine should take any chances of infecting his herd in this manner. Whenever it is necessary to enter the enclosure of the sick animals it would be well to put on rubbers, and cleanse and disinfect them before coming in contact with any healthy swine or their feeding places. Another factor in the spread of the disease is the prowling about of dogs, digging up and eating portions of the dead animals, consequently all dogs in the neighborhood, where hog cholera exists, should be kept tied up and not allowed to roam at large. All dead animals should be immediately burned or buried deeply. Very sick pigs had better be destroyed at once. When the disease appears, heroic measures must be resorted to at once by the swine owner, and he should immediately notify the supervisor of the township, and a member of the State Live Stock Sanitary Commission.

TO SUPERVISORS.

Whenever you hear of an outbreak of swine plague or hog cholera in your township, you should proceed at once to investigate, and should such investigation show that an animal is affected you should notify all owners of swine in the neighborhood, and your local board of health should order a rigid quarantine of each and every affected herd. You should also notify a member of this Commission of the outbreak, location, and the action taken by you. The Commission will assist—by personal visit, if necessary—and take such action as the case may require to prevent further spread of the contagion.

In closing this report we wish to express our appreciation of the efforts of the Experiment Station in behalf of the live stock interests of the State, and to Dr. Charles E. Marshall, bacteriologist, for the careful and cheerful manner in which he has assisted us on every occasion required. We would further call attention to the State Veterinarian's report included in this pamphlet, all of which is respectfully submitted.

H. H. HINDS,
President.

COMFORT A. TYLER,
Secretary

JOHN McKAY,

Dated at Lansing, Michigan, January 19, 1905.

HON. H. H. HINDS, *President of the Michigan State Live Stock Sanitary Commission:*

The State Veterinarian has the honor of presenting the tenth biennial report for the years 1903 and 1904.

In looking over the reports of the State Veterinarians for years past they, like myself, have given a meager description of the various contagious diseases that we have to contend with among the domestic animals of this State, and the work done by the State Veterinarian in diagnosing these diseases. The secretary of the Live Stock Sanitary Commission has furnished about the same class of reading matter, so that there has been a sameness to the report of the State Veterinarian to the Commission and the secretarys' report to the Governors. I take it for granted that the secretary of the Commission, in his present report to the Governor of the State, will give a description of the work done by the Commission, which will include the work done by the State Veterinarian, and I in reporting to the Commission as the State Veterinarian will give the history and symptoms of a contagious disease that has cost the stock raisers of Michigan more in losses than all other diseases combined, and, unfortunately for the farmer, we know very little more about combating the disease than we did twenty-five years ago, but we know more about the means of disseminating the disease than we did then, and that is what I shall endeavor to convey to the reader, the various ways of spreading the disease and the means of avoiding the dissemination of the same. If we can only induce a dozen farmers in the State to take the proper means of preventing the spread of this dread disease and by that means save to them a few hundred dollars in the loss of their hogs we will feel well repaid.

The disease referred to is Hog Cholera.

The United States government reports state that for two years there were 44,841,779 hogs slaughtered under inspection, of this number 106,555 were wholly condemned, and of these 85,904 were affected with hog cholera. From the same source we are informed that the loss from hog cholera has often reached $75,000,000 annually and seldom less than $30,000,000 per annum. Michigan during the past year produced about 979,199 hogs, valued at $7,187,321. Thus we see that the United States loses annually from this disease several times as many hogs as Michigan produces.

The Department of Agriculture has been conducting scientific experiments for the past twenty-five years with a view to elucidating the nature of the disease and developing some practical treatment by which it might be controlled. Much has been discovered as to the effect of certain bacilli, but no satisfactory method of controlling the disease has been discovered. Recently some new and practical points of value have been determined and efforts are being made to prepare a suitable vaccine for this disease. The endeavor to secure a practicable antitoxin is also being continued. Some of our extensive manufacturers of drugs are also working on these lines and before many years we may look for preventive measures or a cure. But now all we can do is to try and prevent the spread of the disease.

This is one of the most contagious of contagious diseases known and when the hog comes in contact with the bacilli or germ he is pretty sure to contract the disease. No amount of filth, want of drainage, impure water or food will cause the disease, but they will help by depleting and weakening the animal so that the germ will find a better field to grow in. An animal that is strong and healthy is not so apt to contract the disease as a weakling.

According to Williams the period of incubation after inoculation is about five days. When propagated by cohabitation it appears according to experiments performed by Dr. Lutton, that the disease took about thirteen days to manifest itself in healthy hogs, among which diseased ones had been introduced.

SYMPTOMS.

We will give only such symptoms as the farmer will be apt to notice.

General prostration, frequent but weak pulse, loss of appetite, ears hanging, a peculiar expression to the face as though the animal was suffering pain, eyes red and watery and dirty secretions adhering to the eye lids, red spots on the ears, abdomen and insides of the legs. These spots are generally painful to the touch but after a day or so become cold and insensible. As the disease advances convulsions are seen, the muscles of the legs contract and the animal stands on his toes. As the disease advances further the animal becomes paralyzed in his posterior extremities. The bowels are generally torpid at first and the feces are black or greenish black and hard and dry. After a few days diarrhœa sets in and the defecations are thin and of a yellowish green color and the odor is very offensive.

These symptoms may vary some, I have seen cases where the first symptoms noticeable were a profuse diarrhea. In some cases after the animals have been affected with the disease for several days the ears and noses will swell and it is not unusual to see animals that do not in the least resemble a hog. The length of time that it takes for the disease to run its course varies from forty-eight hours to two or three weeks. Sometimes two or three animals out of a pen of hogs will act very much better and the owner will imagine that they are going to recover, but this only lasts for a few days, the animals have a relapse and soon succumb to the disease. As the disease advances the animal becomes very weak and in many cases has a dry, hacking cough, although in some cases this latter symptom will not develop.

SOME OF THE MEANS BY WHICH THE DISEASE IS SPREAD.

Cholera affects the stomach and intestines as well as other organs and many of the germs are carried off in the feces and animals coming in contact with this will soon acquire the disease. The germs are carried to distant points by birds and of these the crow and English sparrow do more towards carrying them than any others. The dog, cat, mice and rats and man himself very often thoughtlessly carries the disease.

When hogs have access to running streams of water the stream may carry the disease to farms lower down upon the stream or where the hog yard drains into a stream it may carry the germs. It may be spread by purchasing animals from infected localities, also by exhibiting hogs at fairs. Railway stock cars very frequently serve to carry the disease.

WHAT THE FARMER CAN DO TO PREVENT THE SPREAD OF THIS DISEASE.

On sight of the first symptom that would lead one to believe that he had a disease of a contagious nature among his hogs he should call in a qualified veterinary surgeon and have him diagnose the disease if he decides that it is a contagious disease the next thing to do is to separate the healthy hogs from the diseased ones, and if the weather will permit, the healthy hogs should be sprayed with a good antiseptic when they are removed from the pen and before they are placed in the enclosure where they are to remain. The owner should notify the Live Stock Sanitary Commission of his suspicion of a contagious disease among his hogs, he should place a notice at the usual place of entrance stating that he has disease among his hogs that he has reason to believe is of a contagious nature, if he has a dog he should tie it up and advise his neighbors to tie up theirs.

I knew of a case a short time ago where the hogs kept at a slaughter-house became affected with cholera, the offal from the butchering of cattle was thrown into the hog yard for the hogs to feed upon. A farmer living about a half a mile away noticed his dog one morning eating of a calf head in his barn yard. In about ten days afterwards this farmer had several cases of hog cholera and in a month had lost every hog he had on his farm. No doubt the dog brought the disease to this farm with the calf head. The calf is not so easily controlled, but they too, might be shut up at night. The farmer should be very careful lest he thoughtlessly carry the germs to some of his neighbors himself. Where it is possible a person should take care of the diseased animals that would not have to go near the healthy ones and it is a good plan when going about the sick hogs to have a pair of rubber shoes and discard them when leaving the pens.

As soon as an animal dies it should be placed on a stone boat or some other vehicle (not dragged over the ground) and carried to where it can be buried or burnt up, the latter is preferable but where they have to be buried they should be placed at least three feet below the surface and where there is no chance for drainage to a stream. I recall a case that occurred recently where a farmer selected a swamp for burying a number of hogs that had died from a contagious disease, through this swamp a stream runs that continues its course through several hog yards. In the spring this swamp is overflowed and the disease would be carried to the hog yards lower down on the stream. This swamp was selected as a burying ground for the reason that it was easier to dig a grave there than elsewhere. It would not be advisable to bury on a sand hill that is near a stream as the drainage might pollute the stream. After the diseased hogs have all died the next step is to cleanse the pens and without they are good buildings the best way to destroy the germs is to burn the building, but if this is not advisable then tear out all parts inside that can can be, such as floors and partitions, and burn and use plenty of lime in and around the structure and spray the inside of the building with a solution of carbolic acid or some other good antiseptic once a week for four or five weeks and if possible do not use the building for a hog house for at least a year. The cholera bacillus is very tenacious of life and will live for months.

If the farmers of this state would only make the effort they could reduce the loss by this disease very materially. The symptoms of hog cholera and swine plague are very closely allied. It is difficult to tell one from the other without holding a post mortem. One is as deadly as the other and they are both germ diseases and require the same precautionary measures.

In this synopsis I am indebted for much information gained from articles from the pen of Dr. D. E. Salmon, Chief of the Bureau of Animal Industry of the United States government.

The above is respectfully submitted,

F. C. WELLS,
State Veterinarian.

ELEVENTH BIENNIAL REPORT

OF THE

STATE

LIVE STOCK SANITARY COMMISSION

OF MICHIGAN

FOR THE

YEARS 1905 AND 1906

COMPILED BY THE SECRETARY

BY AUTHORITY

LANSING, MICHIGAN
WYNKOOP HALLENBECK CRAWFORD CO., STATE PRINTERS
1907

STATE LIVE STOCK SANITARY COMMISSION.

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STATE VETERINARIAN.

WM. MORRIS, D. V. S.,	CASS CITY, MICHIGAN

LETTER OF TRANSMITTAL.

Hon. Fred M. Warner, Governor of Michigan:

Sir: The Michigan Live Stock Sanitary Commission have the honor of offering the following report for the biennial period of 1905 and 1906.

The Michigan live stock sanitary law while it stands today practically without change since its original passage is perhaps one of the most efficacious of all similar legal enactments. For a decade or so it has proven in actual practice to have served the farmer and live stock breeders in whose interests it was enacted, in mighty good stead. Michigan, lying as it does, directly in the track of the great cattle traffic from west to east and being traversed by several of the leading trunk lines of railroads is nevertheless, perhaps freer from contagious and infectious diseases of a malignant character than almost any other state in the Union, and at the same time the cost of supervision is less than that of any other state with a single possible exception, having efficient and restricting laws along this line. As many of the farmers and live stock men whom we reach by the means of this report are not entirely familiar with our law as it now stands and the exact method of procedure in case they have need of the services of this Commission we are constrained to include our law as it now stands upon the statute books of Michigan, in this report. This law is entitled "An act to provide for the appointment of a state live stock sanitary commission and a state veterinarian and to prescribe their powers and duties, and to prevent and suppress contagious and infectious diseases among the live stock of the state." Act 182, Public Acts of Michigan, 1885, and will be found in the closing pages of this report.

And is the law under which we are operating today and under which so much has been accomplished. This law has been copied in whole and in part by more states than any other single law in existence.

More than eighty per cent (80%) of the states having sanitary laws of any kind are copied in whole or in part from the Michigan law. The method adopted under this law for stamping out splenic fever was so eminently successful that the Bureau of Animal Industry made public mention of it and adopted similar measures in its national control. That there should be some minor changes in the present law, to keep pace with the universal progress of the times we most fully believe. The most important change required, in our opinion is an amendment providing for compensation for animals destroyed under the direction of the Commission for the public good. As the law now is the owner of the animal is the entire loser. We contend that if it becomes necessary to destroy an animal for the benefit of the public that the public ought to be willing to pay for it and we believe they *are* willing. In fact, we have yet to present the matter to a single individual who, when understanding the matter fully, does not concede the justice of the proposition and we recommend and sincerely hope that this feature may be incorporated into law at the next regular session of the legislature.

During the last biennial period no unusual or serious out breaks of contagious disease has invaded our state unless perchance we may except an outbreak of scabies among the sheep of some northern counties that took place and was controlled in a single season. To be sure we have had individual and perhaps several cases of infectious diseases in numerous localities but all have been controlled without serious results and we most heartily believe that Michigan is today as free from malignant troubles among its domestic animals as it is possible to be in a great state like ours with such varied and extensive live stock interests.

HORSES.

The horse is fortunately nearly or quite immune from many diseases to which others of our domestic animals are quite susceptible.

Glanders or farcy is the one contagious disease of a malignant character to which the horse and mule alone of our domestic animals is most susceptible, that might cause us much alarm. But the system adopted is such that few cases are found within our borders and we have little fear of an epidemic. The malady having proven absolutely incurable in practice we have but one method of handling it, a relentless war of extermination, and until such time as the science of materia medica shall determine or discover some method of treatment that can check the disease, this policy will be pursued by the present Commission. It is in this connection that we would again mention that had we a reasonable compensation law from stock destroyed we believe it would not only assist in the good work, render aid where aid is needed, exhibit justice to parties who now, in a measure, receive injustice in the execution of a wise law, but at the same time would in the course of a few years, become an actual economy inasmuch as it would assist in uncovering and destroying disease giving animals that may and ofttimes do remain under cover, often shifted from place to place and from barn to barn, now and again perchance in the hands of irresponsible parties who have not a thought or heed in the matter other than in turning an ill gotten or easily gotten penny regardless of the loss it may entail.

However, the cases found in our state have usually been brought to our notice at an early date and with the exception of one or two outbreaks in city barns have been confined to single cases, and with perhaps the single exception of an otherwise valuable stallion, the animals have been of small intrinsic value. We do not contemplate any serious trouble in effectually controlling this disease in the state.

CATTLE.

Among cattle the one disease that may give us most concern is tuberculosis and we do not believe that this insidious malady has as firm a foot-hold as is believed by many. During the last biennial period the Commission has applied the tuberculin test to very many herds of dairy cattle, all of which had some suspicion of the disease and we are gratified to report that even under these conditions a very large percentage of the animals tested failed to respond to the test, thus indicating that they were free from the disease. It is also true that some startling developments have taken place, developments that would indicate that once the disease gets a foot hold in a herd or on a premises that none but the most persistent, thorough, systematic and in fact heroic treatment will ever entirely eradicate it.

That it *can* be done we fully believe but the fact that in certain herds where it was known to exist and was believed to be and in fact no doubt *was* stamped out of the herd itself, then to skip a generation or two or three then mayhap present itself suddenly in half a herd or more of young leads us to the belief that the environments of tuberculous cattle must receive the most thorough attention to again become the safe habitation of the bovine. In this as in many other things "eternal vigilance is the price of success." We would say then, if you have not tuberculosis in your herd take every known precaution to avert it. If you suspect it make haste to vertify the truth or falsity of your suspicions and if found to be true, go after its extermination and go after it *hard*. That it will entail some financial loss is sure and certain but if your house is on fire the sooner you extinguish the blaze the less your loss will be. Equally true this of your diseased cattle herd for if once allowed to invade your premises unchecked it will surely burn it out and perchance invade your very home and pluck the fairest flower therein with a relentless hand.

Actinomycosis plays but an unimportant part in our live stock economy. That it exists in isolated cases is true. That it may spread from one animal to another and mayhap to man himself is we believe also true but as a state calamity it is giving us no serious alarm. That we shall continue to class it with the infectious diseases and give it attention when brought to our notice may be depended upon but we do not contemplate serious losses from this malady. In its earlier stages the iodide of potassium treatment will in most cases prove effectual, but after the bone is invaded we lack faith in any treatment proving very efficacious.

BLACK QUARTER OR SYMPTOMATIC ANTHRAX

Has given us very little concern during this period, but a single outbreak having been brought to our notice and in this case such prompt and effective action was taken by the owners of the animals that the actual fatalities were limited to six animals of moderate value. The symptoms of this disease are now so well known and the preventative treatment by the use of Anti-Black leg vaccine so effective that we do not think serious losses will ever again occur from this trouble. This vaccine can be administered by any handy stockman and may be readily procured either from the Bureau of Animal Industry or through the regular channels of the drug trade and no owner of cattle should hesitate to act promptly at the first manifestation of the trouble. That the disease may be readily recognized by the layman who is first brought into its presence we might add that the symptoms of the disease are as follows: Loss of appetite, lack of rumination, animal is staggering in gait, quickly exhausted, and usually tender to the touch along the back, stiffness of the legs when standing, ofttimes with arched back. Eyes usually sunken with copious flow of tears, mouth will likely fill with mucus and blood may run from the nose. Gases will form under the skin in blotches of various sizes along the back and sides from which a crackling sound will emanate whenever the hand is brushed lightly over them. The animal is usually easily excited and ofttimes the mildest animal may become dangerous to approach. Death usually follows in from six to twenty hours after the first symptoms appear. From the third biennial report we quote: "Anthrax is a disease known under different names, among which are black leg, black tongue, black quarter, etc., which include a group of diseases very virulent, malignant and contagious, appearing in different forms externally and internally, and attacking the different species of lower animals and man himself, in an epizootic, enzootic, or sporadic manner, according to the influences that produce it, or whether it is got by inoculation; it sometimes arises spontaneously in low, damp, rich pastures and along the banks of overflowed streams, or where ponds have been drained off or dried up, the soil containing a large amount of organic matter. Long continued warm, dry weather forming the emanations of organic matter and miasmatic gases, form its development."

The disease known as Grand Traverse disease, Sand disease, and other local names that has given us so much concern and with which we seemed to make no progress may be in a way to be controlled. The Experiment Station under the direction of Prof. Clinton D. Smith of the Agricultural College became very much interested in this trouble and took up a very systematic and intelligent investigation along the line of a curative treatment and up to the date of the writing of this article some very encouraging and startling results have attended his efforts. We would respectfully suggest that any stockman within the zone of this difficulty, that seems to be confined to a fairly restricted locality, write Prof. Smith as above noted for the results of their experiments and we feel that he will be able to offer suggestions that will be of incalculable value to the cattle man of the Grand Traverse district.

Contagious Ophthalmia—Very few cases of this trouble have been brought to our notice during this biennial period. There have been occasional individuals who suffered slight losses, but no severe outbreaks. When a case is discovered the animal should be removed from the balance of the herd and at once placed in a well darkened stable as the sunlight is very painful to the suffering beast. A mixture of equal parts of calomel and boracic acid puffed into the eye with an insect gun, twice daily and a wash once a day of any mild antiseptic will usually bring relief in from 24 to 48 hours.

RABIES-HYDROPHOBIA.

While the Commission have been called to take active measures in many cases of hydrophobia during the last two years, but few localities have had serious losses. Where the local authorities have taken active measures to restrict the spread of the malady pending the arrival of the Commission it has usually been confined to its initial quarters. The method of handling this difficulty is to rigidly quarantine or securely muzzle every dog in a suspected territory under the supervision of the supervisors of the several townships until such time as the extent of the infection or the absolute correctness of the diagnosis may be positively determined, when every dog known to have been bitten by a rabid canine will be destroyed. It has not been the policy of the Commission to order the destruction of domestic animals, even though known to have been bitten by a supposedly rabid dog, as not all such develop the disease, and should they show symptoms of the malady they may then be destroyed to save them several days of intense suffering, as death is inevitable. While it is no doubt a scientific fact that hydrophobia *may be* contracted by one animal from another and perchance the horse or the pig might infect his neighbor, so also the cow and the sheep could you induce them to inflict an open wound and deposit the saliva therein, the present Commission are ready to say that never in their observation of many hundreds of cases has the disease been conveyed by any other animal than the dog, and we believe him to be the only source of serious danger with the possible exception of the domestic cat, and Tabby, being a nimble lass, is likely to take to the backyard fence or the convenient cherry tree when the rabid dog is abroad, from which vantage ground she spits defiance at her tormentor until he goes his way; thus she is not likely to be bitten; but should she be, then by all means destroy her at once, for her domestic nature and natural tendencies to be the comrade and boon companion of the babies make her a doubly dangerous creature should she become afflicted with the malady. In a supplement to the report of the State Board of Health for 1895, we find the following, which is so exactly applicable, and withal so very sensible, we shall take the liberty of quoting it verbatim.

RULES AND REGULATIONS SHOULD BE FRAMED AND PUBLISHED.

One of the most efficient means employed for the restriction of the spread of rabies is a set of rules which shall regulate the action and movement of animals infected with the disease. Each local board of health should frame and publish (in accordance with the State laws) rules which would enable the health officer to act promptly upon the appearance of a case of this disease so dangerous to the public health and life. If a health officer is obliged to wait until the local board can be called together the disease may have been allowed to spread instead of restricting it to the first case. On the occurrence of a case of rabies the fact should be reported to the local health officer and promptly restricted by him in accordance with act 137, laws of 1883. The health officer should, in compliance with sections 5 and 6, act 125, laws of 1889, report the fact to the Live Stock Sanitary Commission. The local health authorities should isolate the animal or animals and keep them so until they are taken care of by the State Live Stock Commission or State Veterinarian; but under no circumstances should the local health authorities fail to guard the public health and life. Whether in man or animals the full fact regarding the outbreak of the disease should be reported to the secretary of the State Board of Health at Lansing. In the cities the "dog ordinance" generally regulates the actions of animals most likely to be infected with rabies. Every city should be equipped with an efficient ordinance and should demand its strict enforcement. An ordinance may be ever so efficient, but if not enforced is useless, and the stray and ownerless dogs will be permitted to roam about the cities to become infected with rabies and transmit the disease to human beings. For the restriction of the spread of rabies and hydrophobia, it is important that prompt action should be taken with any suspicious animal. When a dog or other animal acts strangely and there is suspicion of madness the animal should be immediately confined, not killed, and kept under observation for a week or ten days. Have the animal examined by a competent physician or veterinary surgeon, and if the animal is rabid the characteristic symptoms will soon be observed. Pasteur says the animals will certainly die within eight days. If at the end of that time no symptoms of rabies have been observed the bite cannot cause hydrophobia, and there is no reason why the animal should be destroyed. If symptoms of rabies do appear in the animal thus under observation, it should be immediately killed. And, if the animal has bitten a human being, a small portion of the medulla oblongata should be secured and placed in a small vial containing pure glycerine only, for use in experimental inoculations of other animals to determine without doubt whether the animal suspected of rage was really rabid. If other animals have been bitten by a suspicious animal they should likewise be confined until it is proven whether or not they are rabid, or until the period of incubation has passed. It is quite frequently the case that valuable stock has been bitten by animals not rabid, and it would be a useless destruction of property to destroy such animals. Do not kill an animal unless you have good reason to believe it is rabid, or unless it is a source of danger to other animals and to human life. Of course a dog may run mad when it is quite impossible to secure the dog, and extremely dangerous for it to run at large, where shooting the animal may be the only safe way. In such a case the animal should not be disposed of until it is absolutely certain that no person has been bitten. If a person has been bitten a portion of the medulla should be prepared as described above. If a human being has been bitten and the animal is destroyed there is no other way left to ascertain whether or not the dog was really mad, and whether the person bitten has been inoculated with the virus of this terrible disease.

If precautions as above outlined are taken, we do not think any unusual apprehension need to be felt in regard to rabies.

DISEASES OF SHEEP.

Among all of our live stock the sheep alone is susceptible to nearly all of the contagious diseases of a malignant character, which affect our domestic animals. Practically, it is immune from none of them. However, internal parasites are the cause of more financial losses to the Michigan flock masters than all other contagious and infectious diseases combined, to which this animal is susceptible. Of these internal parasites two different classes are especially destructive. One is known as the twisted stomach worm, scientifically known as *strongylus contortos*. Its habitat is the fourth stomach and while adult sheep are able to withstand the attack of this small parasitical worm, the ravages of the parasite is particularly destructive to lambs. The other destructive parasite is known as nodular disease, scientifically known as *esophagostoma columbianum*. The habitat of this parasite is in small nodules in the walls of the bowels throughout their entire length. It affects both old and young sheep. Treatment of an animal affected with nodular disease is entirely unavailing. Various treatments are recommended for the stomach worm such as gasoline and milk, and turpentine and milk. So far as these parasites are concerned, preventative measures are much more efficacious than treatment of seriously affected animals. The use of vermifuges and tobacco kept constantly before the flock, mixed in their salt boxes, is undoubtedly of very great value. It is particularly desirable that sheep be grazed upon upland pastures, that are frequently cultivated. If the flock could be frequently changed to fresh pastures it is very desirable. Low lands and wet swampy pastures carrying stagnant water are exceedingly unwholesome environments in which to place a flock of sheep.

The fact of the presence of internal parasites in large numbers of Michigan flocks makes the lamb feeders particularly cautious in buying Michigan lambs for feeding. Hence, our extensive feeders prefer to buy western lambs for feeding purposes at much higher prices than they are willing to pay for our Michigan output.

The infectious external parasite, commonly known as scab or scabies, scientifically known as *psoroptes* is the disease that is universally recognized as the arch enemy of the sheep industry. Dr. D. E. Salmon, for a score of years the Chief of the Bureau of Animal Industry, says of this parasite: "Of all the diseases of sheep in this country, scab is the worst feared by the flock master. So insidious in its attack, so rapid its course, so destructive its effects, and so difficult is it to exterminate that it has justly earned the distinction of being more injurious than any other disease caused by external parasites. Scab alone, of the parasitic diseases, has become the subject of legislation in most countries; and yet, if proper precautions were taken and a radical treatment followed, this disease could soon be completely eradicated."

This parasite may by vigilance be eradicated not only in a flock but in a township, county or a state. The remedy is the dipping vat. Infected flocks should be at once dipped, each animal remaining in the bath for not less than three minutes, same to be repeated in exactly ten days and at each dipping the animals should be changed to clean and uninfected environments. If this work has been carefully carried out, as above indicated, this destructive parasite will be removed from a flock in nine cases out of ten and probably ninety-nine out of a hundred.

As to dips. There are many of them that are entirely efficacious. The general government recommends the lime and sulphur dip. This dip is severe upon the animals and decidedly injurious to the wool. This Commission believes that the coal tar dips are the most effective.

A very large percentage of the sheep of commerce, that are brought to Michigan by our feeders have been exposed to scab in transit or in the stock yards where they have been handled. Arrived within our borders, as might be anticipated, many of these bands of sheep develop the affection. So far as feeding sheep are concerned, the contagion is not spread. Such bunches as develop the infection are thoroughly dipped twice and in many cases are first shorn. Being returned to the same environments perhaps before the feeding period ends, additional cases may develop from reinfection. Dipping is again resorted to if many cases develop but if only a few show the affection, "hand treating," as it is termed, is resorted to, and the trouble held in check. These muttons, when fatted, go to market for immediate slaughter. The stock sheep are usually not exposed to these feeders at all. Therefore, the disease is not spread.

One of the branches of the sheep industry in Michigan, that is rapidly developing, and is likely to reach large proportions, is the establishing of extensive grazing ranches in many of the northern counties. Sheep and goats are particularly adapted to this means of utilizing and reclaiming large tracts of stump or cut over lands in counties where extensive lumbering operations have been carried on. But little open ranging has been done in Michigan. These ranches stock up with what is known in sheep parlance as "westerns." Hundreds and thousands of these sheep, coming not only from the mountain states but from Oregon and Washington as well, in their long transit and many times necessarily unloading at feeding and resting stations, are sometimes exposed to scabies and develop the infection upon the ranges that have been alluded to. Once the sheep stock of these ranches become infected, it is a serious matter to eradicate it. As change of pastures is usually impossible, the sheep after dipping are returned to the same environments and become reinfected. In some cases it has seemed to be necessary to entirely clear the ranch of sheep for a year or two, running other stock in their places, in order that the infection may die out in these environments.

In the spring of 1905 a single carload of western sheep were brought to one of the northern counties, we have been discussing, by a young man, who had been reared in the vicinity where he unloaded these sheep. The owner trailed this band of sheep perhaps fifty miles to an adjoining county where he established his camp for the summer on the shore of a lake, and permitted these sheep to range in the vicinity. The flock developed scab. No settlers' sheep were ranging near them and the infection was not spread during the summer. In the fall the owner sold his holding to a stock dealer and shipper, who brought the flock back to the vicinity where they were unloaded the spring before, and into a zone of fenced farms carrying many sheep. Not only were the westerns, that we have been following, distributed throughout the country but two different parties handling portions of them, were selling rams, which had been herded in the environments occupied by this infected flock. The result was that scabies was spread to very many townships in five different counties before the spring of 1906, and before the presence of this infection was known to this Commission. As it was very common in all of these counties for many farmers to permit their sheep to run upon the highway and upon the open commons, it was impossible to quickly determine just how extensive the infection had been spread or to determine how many different flocks were infected. In the emergency, this Commission deemed it not only wise but absolutely imperative to quarantine all of the sheep in three counties and several townships in two other counties. This quarantine was placed on this territory on the 10th of April, 1906. The Commission immediately asked and received the entire and effective co-operation and assistance of all of the supervisors representing the townships placed under quarantine. With this assistance and co-operation, they were able to locate in the following ninety days every infected flock and place same under close quarantine. Thereby they were enabled to raise this general quarantine on July 5th, establishing perhaps a new record in any state for expeditious corraling of all infected flocks in so wide a territory as this outbreak had covered. The Commission is very glad to be able to state that not a single additional flock has become infected since the first quarantine was placed upon the infected territory.

DESCRIPTION OF SHEEP SCAB.

COMMON SCAB, BODY SCAB, OR PSOROPTIC SCAB.

Although the symptoms of common scab are familiar to most farmers, they will here be briefly reviewed.

The mites of common, or body scab—that is Psoroptes—prick the skin of the animal to obtain their food and probably insert a poisonous saliva in the wound. These bites are followed by intense itching, with irritation, formation of papules, inflammation, exudation of serum, and the formation of crusts, or scabs, under and near the edge of which the parasites live. As the parasites multiply they seek the more healthy parts, spreading from the edges of the scab already formed, thus extending the disease. The sheep are restless; they scratch and bite themselves, and rub against posts, fences, stones, or against other members of the flock. This irritation is particularly noticeable after the animals have been driven, for the itching is more intense when the sheep becomes heated. The changes in the skin naturally result in a falling of the wool;

at first slender "tags" are noticed; the fleece assumes the condtion known as "flowering;" it looks tufty or matted, and the sheep pulls out portions with its mouth, or leaves tags on the objects against which it rubs. Scabs fall and are replaced by thicker and more adherent crusts. The skin finally becomes more or less bare, parchmentlike, greatly thickened, furrowed and bleeding in the cracks. With shorn sheep, especially, a thick, dry, parchment-like crust covers the greatly tumified skin. Ewes may abort or bear weak lambs.

Parts of Body Affected.—When sheep are kept in large numbers the chances for infection are naturally greater, and the disease may begin on almost any part of the body. Generally, however, it affects the parts which are covered with wool. When the sheep are fat and the wool has a large amount of yolk, the progress of the disease may be slow; usually beginning on the upper part of the body, withers and back, it extends slowly but none the less surely, and in ever-increasing areas, to the neck, sides, flanks, rump, etc. In two or three months the entire body may be affected.

Contagion.—Common scab is exceedingly contagious from one sheep to another, and may in some cases show itself within about a week after healthy sheep have been exposed to infection. The contagion may be direct, by contact of one sheep with another; or indirect, from tags of wool, or from fences, posts, etc., against which scabby sheep have rubbed, or from the places where the sheep have been "bedded down." One attack of scab does not protect sheep from later attacks.

Chances of Recovery.—Cases of apparent spontaneous recovery are rare. Usually when proper methods of treatment are not adopted the disease increases, leads to anæmia, emaciation, exhaustion and death, and may result in a loss of from 10 to 80 per cent of the flock. Scab is favored by seasons when the wool is longest, and by huddling or over-crowding the animals; also race, energy, temperament, age, state of health, length, fineness of and abundance of wool, and the hygienic conditions of the surroundings influence the course and termination of the disease. Young, weak, closely inbred animals, and those with long, coarse wool will most quickly succumb. Unhealthy localities, damp climate and poorly ventilated sheds favor the disease. Pure or mixed Merino sheep succumb sooner than certain other breeds. The mortality varies according to conditions, but is highest in autumn and winter. When owners are careless the death rate may be very high; if untreated the sheep may die in two or three months. Hygienic conditions, good food and cool, dry atmosphere tend to check, the disease. Sheep sheds should accordingly be well ventilated and open to light and sunshine. With proper attention to hygienic conditions and thorough dipping, a positive cure can be guaranteed.

Vitality of the Parasite.—Taken from the sheep the mites possess a remarkable vitality. It is generally stated that, kept at moderate temperature on portions of scab, the adults may live from four to twenty days, but they will occasionally live much longer; cases are on record where they have lived three, four, or even six weeks when separated from sheep; if the atmosphere is dry they will generally die in about fifteen days; but death is often only apparent, for the mites may sometimes be revived by warmth and moisture even after six or eight weeks; the fecundated females are especially tenacious of life. Various, rather contradictory statements may be found regarding their resistance to cold. Krogman states that they may live at a temperature of minus 10° C. (+14° F.) for twenty-eight days. Other authors claim that the mites die in two hours at 47° F., still other authors, that they die at 50° C. (122° F.) They are said to have been kept alive in cold water for six days and in warm water for ten days. Several authors admit, however, that the parasites are usually killed by a soaking rain; though it is claimed that in damp, dark stables they "may live for months."

Experience has shown that in some cases apparently healthy sheep have become infected in places where no sheep have been kept for four, eight, twelve or even twenty-four months. The conditions underlying this infection are not thoroughly understood. Possibly some of the eggs have retained their vitality a long time and then hatched out; possibly the vitality of the fecundated female has also played a role; while it is not at all improbable that an entire new infection has accidentally been introduced by birds or other animals. Certain authors of high standing scout the idea that birds can introduce an infection of scab, but there is no reason why birds should not do this, and there are some reasons for believing that they do. It has been noticed on the Experiment Station of the Bureau, for instance, that crows delight in perching on the backs of scabby sheep and picking at the scab. While so doing it is only natural that small tags of wool should adhere to their feet, and thus scatter scab. The fact that snails cling to birds' feet and are carried long distances is too well established to need discussion, and it is very probable that many of the cases where sheep are supposed to have become infected with scab on pastures which have not been occupied for one or two years are in reality cases of fresh infection by means of birds. From the data at hand, while it may be admitted that in some cases, under favorable conditions, the mites may live from spring to fall, it is scarcely within the limits of probability that either the scab mites or their eggs will live through a winter when separated from the sheep and exposed to the elements.

All matters connected with the vitality of the scab mite have an important bearing in explaining cases of indirect infection on roads over which scabby sheep have been driven, or in fields and sheds where they have been kept. From the facts now at our disposal we can lay down the following important rules:

(1) Scabby sheep should never be driven upon a public road; (2) sheds in which scabby sheep have been kept should be thoroughly cleaned, disinfected and aired, and should be left unused for at least four weeks (better two months) before clean sheep are placed in them; (3) fields in which scabby sheep have been kept should stand vacant *at least four weeks* (better six or eight) before being used for clean sheep; (4) a drenching rain will frequently serve to disinfect a pasture, but it is well to whitewash the posts against which scabby sheep have rubbed. Even after observing the precautions here given it is not possible to absolutely guarantee that there will be no reinfection, but the probabilities are against it.

Life History of the Parasite.—A study of the life history of the scab parasite is necessary in order to determine several important points of practical value, such as the proper time for the second dipping, etc.

The female mite lays about 15 to 24 eggs on the skin, or fastened to the wool near the skin; a six-legged larva is hatched; these larvæ cast their skin and become mature; the mites pair and the females lay their eggs, after which they die. The exact number of days required for each stage varies somewhat, according to the writings of different authors, a fact which is probably to be explained by individual variation, and by the conditions under which the observations and experiments were made. Thus Gerlach, in his well-known work (1857), estimates about fourteen to fifteen days as the period required for a generation of mites from the time of pairing to the maturity of the next generation. He divides this time as follows: Under ordinary conditions the eggs hatch in three to four days, although two authors allow ten to eleven days for the egg stage; three or four days after birth the six-legged larvæ moult and the fourth pair of legs appears; this fourth pair is always present when the mites are two-thirds the size of the adult; when seven to eight days old the mites are mature and ready to pair; several (three or four) days are allowed for pairing; another generation of eggs may be laid fourteen to fifteen days after the laying of the first generation of eggs. Without going into all of the other observations on these points, it may be remarked that the eggs may not hatch for six or seven days; the six-legged larvæmaymoult when three to four days old, and become mature; after pairing a second moult takes place, lasting four to five days; a third moult follows immediately, then eggs are laid and the adults die; in some cases there is a fourth moult, but apparently without any further production of eggs. Accepting Gerlach's estimate of fifteen days as an average for each generation of ten females and five males, in three months' time the sixth generation would appear and consist of about 1,000,000 females and 500,000 males.

Several practical lessons are to be drawn from these figures: First, it is seen that the parasites increase very rapidly, so that if scab is discovered in a flock, the diseased sheep should immediately be isolated; second, if new sheep are placed in a flock, they should either first be dipped, as a precautionary measure, or they should at least be kept separate for several weeks to see whether scab develops; third, since the chances for infection are very great, the entire flock should be treated, even in case scab is found only in one or two animals; fourth, as dipping is not certain to kill the eggs, the sheep should be dipped a second time, the time being selected between the moment of the hatching of eggs and the moment the next generation of eggs is laid. As eggs may hatch between three and seven (possibly ten or eleven) days, and as fourteen to fifteen days are required for the entire cycle, the second dipping should take place after the seventh day, but before the fourteenth day; allowing for individual variation and variation of conditions, the tenth, eleventh or twelfth day will be the best time to repeat the dipping.

IMPORTANCE OF PROPER USE OF DIP.

Whatever dip is selected, the farmer should not forget that there are two ways to use that dip. One way is to prepare and use it in accordance with the directions given; the other way is to attempt to economize time, labor, or money by using the dip in weaker proportion than advised, by hurrying the sheep through the swim, or by later placing the dipped sheep under unfavorable conditions. If the former method is adopted with any of the established dips, the treatment ought to be followed with favorable results; but if the latter method is adopted, the farmer himself must assume the responsibility of failure, no matter which dip he decides to use. Every farmer should therefore remember that when he has decided upon the dip he is to use his work is only begun; to use the dip properly is fully as important as to use a dip at all.

The Pastures.—In case it is necessary to place the dipped sheep on the same pastures they occupied before being dipped, it is always best to use a dip containing sulphur. If a proprietary dip is selected under those circumstances, it is suggested that sulphur be added, about 1 pound of flowers of sulphur to every 6 gallons of dip. In case it is possible to utilize fresh pastures after dipping, the use of sulphur is not so necessary, but it is always advisable. The object in using sulphur is to place in the wool a material which will not evaporate quickly, but will remain there for a longer period of time than scab parasites ordinarily remain alive away from their hosts. By doing this the sheep are protected against reinfection.

HOG CHOLERA AND SWINE PLAGUE.

The ravages of this fatal disease has and is causing more financial loss to the farmer of Michigan at the present time than any and all other contagious diseases of domestic animals combined. The Commission is constantly called upon during the hot summer and fall months by farmers, stockmen, and feeders in nearly all parts of the state to assist in the control of this malady. In all cases the Commission or some member thereof undertake to visit the locality, go over the infected district and assist in every possible way to prevent its farther spread, and in this connection allow us to say that in the opinion of this Commission this disease, hog cholera, swine plague, or whatever you may choose to call it, in its various phases and manifestations, be it correctly named or misnomer; this plague, let us reiterate, is the most serious menace to the farmer of Michigan that he has to confront today. Until such time as the science of materia medica shall exploit some remedy in the form of a curative agent, or antitoxin preventative (and it is in this latter form that the effective treatment will eventually appear, in the opinion of the Commission), until such time, we say, as something not yet exploited or brought to the attention of this Commission we only ask the privilege of fencing him in with a fence so high that the dog of the farm or the neighbor's farm cannot climb it, the chicken crawl under it, or the pesky English sparrow fly through it, and then lay down at the behest of his majesty, hog cholera, swine plague, pneumonia, call it what you please, it kills them anyway. When an outbreak occurs we usually find the farmer ready and willing to adopt heroic measures to save his swine. When we consider the sanitary conditions and surroundings of the yards of many of the places we visit we sometimes are led to wonder that so many hogs survived the ordeal. The Bureau of Animal Industry are constantly employing scientific experts in making research and investigation along the line of prevention and cure but up to and including the present time no very satisfactory results have been attained.

CAUSES OF HOG CHOLERA AND SWINE PLAGUE.

As was stated in the last report of the Commission, the result of past experiments show that the germs of hog cholera find their way into the bodies of swine with the food and drink, by infection, through sores and flesh wounds, and by inspired air; while those of swine plague are taken almost entirely with the air and through the lungs. Hog cholera germs are very hardy and vigorous. They are able to live for a long time and multiply in the water of ponds and streams. They may live in the soil for at least three months, and in accumulations of straw and litter for a much longer time. They withstand drying and other adverse conditions in a remarkable manner; and will survive in a frozen state for two or three months. The two diseases are sometimes found doing their destructive work together.

CAUSE OF OUTBREAK.

In every instance where definite information could be obtained, outbreaks of hog cholera, or contagious diseases among swine, have been traced to the importation of swine from other states or from infected districts in this state, or from railroads transporting diseased animals. When the germ is once planted and the disease makes its appearance in a herd, its spread to other herds in the vicinity can only be prevented by exercising and enforcing the most careful and rigid measures. The disease may be carried from herd to herd, and from farm to farm, not only by "flesh devouring animals, birds and insects," but by water courses, through drain tile, heavy showers washing under fences and across enclosures, and on the wheels of vehicles and feet of persons and animals.

SYMPTOMS.

The symptoms of hog cholera are so varied, according to conditions of the disease that it would be almost impossible to give a description that would positively identify the disease in every instance. Therefore it would be well for every farmer, when he notices anything unusual in his swine, such as loss of appetite, diarrhea, or dullness and indisposition to come to the feed trough, or leave their sleeping quarters, to take the precautions necessary to control an outbreak of hog cholera.

SUGGESTIONS AND PRECAUTIONS.

If the farmers of Michigan who raise swine can be induced to generally adopt better sanitary precautions and improve the environments of their swine yards and pens, especially during the summer months, we are confident that the annual losses from swine plague and hog cholera may be ultimately reduced to a minimum each season, and save many thousands of dollars, that are annually lost to Michigan swine raisers.

The best plan is to prevent an outbreak if possible, even though the disease is ravaging in the neighborhood. First, weed out all "runts," leaving only well developed pigs in the herd. Frequently clean out all pens, yards, sleeping places and troughs. If you have an old swill barrel or tub that has stood over from last season knock it to pieces and burn it.

It is too true that the average swill barrel stands in "a hole in the ground" for several seasons without a single thorough cleaning or disinfection.

Frequently clean out and disinfect with plenty of fresh lime in solution of one-half pound of lime to one gallon of water. From one to two ounces of crude carbolic acid may be added. Use a sprinkling can or spray pump and thoroughly saturate all places liable to be infected.

Furnish plenty of pure, fresh water every day to each animal from now until late in the fall. See that plenty of shade is available during hot weather. Feed liberally and make each pig grow every day from birth. Furnish charcoal, salt, ashes, burnt cobs, either singly or in combination.

The government formula is as follows:

Wood charcoal	1 pound.
Sulphur	1 pound.
Sodium sulphate	1 pound.
Antimony sulphide	1 pound.
Sodium bicarbonate	2 pounds.
Sodium chloride	2 pounds.
Sodium hyposulphite	2 pounds.

These ingredients should be completely pulverized and thoroughly mixed.

Dose, one large tablespoonful of the mixture once a day for each 200 pounds weight of the hogs to be treated. The medicine should be given in soft feed, as corn meal or ground oats, or crushed wheat, mixed with bran or middlings well moistened with hot water.

A well developed pig, with a strong constitution, is far better able to resist the attack and evasion of swine plague germs, than is the pig that has a weakened constitution, and is forced to live, eat and drink in filthy, germ-laden quarters, with no shade or fresh water furnished daily. Under such conditions, the "survival of the fittest" frequently leaves nothing but the hog pen after the scourge is over.

Every swine owner should keep sharp watch, and, whenever the disease appears, remove the healthy swine from the pen where the outbreak occurs. Do this every time, putting the healthy hogs into new, clean and dry quarters, well disinfected. Never remove sick pigs from a pen, leaving a healthy one instead, to in turn become infected. Keep the two lots of pigs entirely separated, so that no animal or vehicle can pass from one pen to the other.

One important fact to be borne in mind is the fruitful source of the spread of contagion by the visit of one neighbor to another in order to view the sick swine. No owner of swine should take any chances of infecting his herd in this manner. Whenever it is necessary to enter the enclosure of the sick animals it would be well to put on rubbers, and cleanse and disinfect them before coming in contact with any healthy swine or their feeding places. Another factor in the spread of the disease is the prowling about of dogs, digging up and eating portions of the dead animals, consequently all dogs in the neighborhood, where hog cholera exists, should be kept tied up and not allowed to roam at large. All dead animals should be immediately burned or buried deeply. Very sick pigs had better be destroyed at once. When the disease appears, heroic measures must be resorted to at once by the swine owner, and he should immediately notify the supervisor of the township, and a member of the State Live Stock Sanitary Commission.

TO SUPERVISORS.

Whenever you hear of an outbreak of swine plague or hog cholera in your township, you should proceed at once to investigate, and should such investigation show that an animal is affected you should notify all owners of swine in the neighborhood, and your local board of health should order a rigid quarantine of each and every affected herd. You should also notify a member of this Commission of the outbreak, location, and the action taken by you. The Commission will assist—by personal visit, if necessary—and take such action as the case may require to prevent further spread of the contagion.

In closing this report we wish to express our appreciation of the efforts of the Experimental Station in behalf of the live stock interests of the state, and to Dr. Charles E. Marshall, bacteriologist, for the careful and cheerful manner in which he has assisted us on every occasion required.

H. H. HINDS,
President.

COMFORT A. TYLER,
Secretary.

JOHN McKAY.

Dated at Lansing, Michigan, January 15, 1907.

PROTECTION OF DOMESTIC ANIMALS AND OTHER PROPERTY.

AN ACT to provide for the appointment of a State Live Stock Sanitary Commission and a State Veterinarian, and to prescribe their powers and duties, and to prevent and suppress contagious and infectious diseases among the live stock of the State.

[Act 182, P. A. 1885.]

The People of the State of Michigan enact:

The state live stock sanitary commission.
To consist of three persons practical agriculturists.
To be appointed by governor, etc.
Term of office.
When to be appointed.
Veterinary surgeon.
Term of office.

(1.) § 5627. Section 1. That a Commission is hereby established which shall be known under the name and style of "the State Live Stock Sanitary Commission." The Commission shall consist of three commissioners who are practical agriculturists and engaged in the live stock industries of the state, who shall be appointed by the governor with the advice and consent of the senate. One shall be appointed for the term of six years, one for the term of four years, and one for the term of two years, whose term of office shall commence on the second Tuesday of July of the year in which they are appointed and shall continue until their successors are appointed and qualified. And at each succeeding biennial session of the legislature there shall be appointed in like manner one commissioner who shall hold his office six years or until his successor is appointed and qualified. The governor shall also appoint with the advice and consent of the senate a competent and skilled veterinary surgeon for the state who, at the time of such appointment shall be a graduate in good standing of a recognized college of veterinary surgery and who shall hold his office two years from the second Tuesday of July of the year he is appointed and until his successor is appointed and qualified. The governor shall also appoint every two years thereafter a competent and skilled veterinarian having the qualifications above mentioned, whose term of office shall be for two years or until his successor is appointed and qualified.

How. 2136k.

Constitutional oath of office.

(2.) § 5628. Sec. 2. Said commissioners and veterinary surgeon before they enter upon the duties of their office shall

each take and subscribe the constitutional oath of office and file the same with the secretary of state.

How. 2136l.

Compensation of commissioner and veterinary surgeon.

(3.) § 5629. Sec. 3. Each Commissioner shall receive the sum of three dollars per day and necessary expenses for the time actually spent in the discharge of his duties; and the veterinary surgeon shall receive the sum of five dollars per day and necessary expenses for time when employed.

How. 2136m.

Duty of the commission.

Quarantine regulations, etc.

(4.) § 5630. Sec. 4. It shall be the duty of the Commission to protect the health of the domestic animals of the state from all contagious or infectious diseases of a malignant character, and for this purpose it is hereby authorized and empowered to establish, maintain and enforce such quarantine, sanitary and other regulations as it may deem necessary.

How. 2136n.

The commission is the sole tribunal to determine whether the animals are diseased and to ascertain their value, and is to be governed by the value at the date of appraisal. The only appellate jurisdiction provided for by the statute is the governor, whose approval of the action of the commission is necessary.—Shipman v. Sanitary Commission, 115 / 488.

Duty of persons to report disease to health officer.

(5.) § 5631. Sec. 5. It shall be the duty of any person who discovers, suspects, or has reason to believe that any domestic animal belonging to him or in his charge, or that may come under his observation, belonging to other parties, is affected with any disease, whether it be a contagious or infectious disease, to immediately report such fact, belief, or suspicion to the Live Stock Sanitary Commission, or a member thereof, or to the local board of health or some member thereof.

How. 2136o.—Am. 1887, p. 122; App. May 13; Act 105.—Am. 1889, p. 145; App. May 31; Act. 125.

Duty of local board of health to investigate cases reported.

Commission to quarantine.

Expenses, how paid.

(6.) § 5632. Sec. 6. It is hereby made the duty of all local boards of health, to whom cases of contagious or infectious diseases are reported, to immediately investigate the same, either in person by some member or members of the board, or by the employment of a competent and skilled veterinarian; and should such investigation show a reasonable probability that a domestic animal is affected with a contagious or infectious disease of a malignant character, the local board of health shall immediately establish such temporary quarantine as may be necessary to prevent the spread of the disease, and report all action taken to the Commission or to some member thereof; and the acts of local boards of health establishing temporary quarantine shall have the same force and effect as though established by the Commission itself, until such time as the Commission may take charge of the case or cases, and relieve the local board of health. All expenses incurred by local boards of health in carrying out the provisions of this act shall be paid in like manner as

are other expenses incurred by said boards in the discharge of other official duties.

How. 2136p.—Original sec. 6 repealed, 1887, p 122; App. May 13; Act 105.—New sec. 6 added 1889, p. 145; App. May 31; Act 125.

Commission to quarantine.

To notify the state veterinarian.

To report to the commission.

Powers and duties of the commission and veterinarian.

(7.) § 5633. Sec. 7. The Commission or any member thereof to whom the existence of any infectious or contagious disease of domestic animals is reported shall forthwith proceed to the place where such domestic animal or animals are and examine the same, and if in his or their opinion any infectious or contagious disease does exist he or they shall prescribe such temporary quanantine and regulations as will prevent the spread of the contagion or infection, and notify the state veterinarian, who shall forthwith proceed to the place where said contagious or infectious disease is said to exist and examine said animal or animals and report his or their finding to the said Commission, who then shall prescribe such rules and regulations as in their judgment the exigencies of the case may require for the effectual suppression and eradication of the disease, and for that purpose the said Commission may list and describe the domestic animals affected with such disease and those which have been exposed thereto and included within the infected district or premises, so defined and quarantined with such reasonable certainty as would lead to their identification, and no domestic animal liable to become infected with the disease or capable of communicating the same shall be permitted to enter or leave the district, premises or grounds so quarantined, except by the authority of the Commission. The said Commission shall also, from time to time, give and enforce such directions, and prescribe such rules and regulations as to separating, mode of handling, treating, feeding, and caring for such diseased and exposed animals as it shall deem necessary to prevent the two classes of animals from coming in contact with each other, and perfectly isolate them from all other domestic animals which have not been exposed thereto and which are susceptible of becoming infected with the disease, and the said Commission and veterinarian are hereby authorized and empowered to enter upon any grounds or premises to carry out the provisions of this act. When in the opinion of the Commission it shall be necessary to prevent the further spread of any contagious or infectious disease among the live stock of the state, to destroy animals affected with or which have been exposed to any such disease, it shall determine what animals shall be killed, and appraise the same, as hereinafter provided, and cause the same to be killed and the carcasses disposed of as in their judgment will best protect the health of domestic animals of the locality.

How. 2136q.

To notify the governor of quarantine.

(8.) § 5634. Sec. 8. When the Commission shall have determined the quarantine and other regulations necessary to prevent the spread among domestic animals of any malignant, contagious, or infectious disease found to exist among the live stock of the state, and given their order as hereinbefore provided, prescribing quarantine and other regulations, it shall notify the governor thereof, who shall issue his proclamation proclaiming the boundary of such quarantine and the orders, rules, and regulations prescribed by the Commission, which proclamation may be published by written or printed hand bills posted within the boundaries or on the lines of the district, premises, places, or grounds quarantined: Provided, That if the Commission decide that it is not necessary, by reason of the limited extent of the district in which such disease exists, that a proclamation should be issued, then none shall be issued, but such commission shall give such notice as may to it seem best to make the quarantine established by it effective.

Governor to issue quarantine proclamation.

How. 2136r.

Commission to appraise animal ordered killed.

(9.) § 5635. Sec. 9. Whenever the Commission shall direct the killing of any domestic animal or animals it shall be the duty of the Commissioners to appraise the animal or animals condemned, and in fixing the value thereof the commissioners shall be governed by the value of said animal or animals at the date of appraisement.

How. 2136s.

To issue a certificate to owner.

(10.) § 5636. Sec. 10. Whenever any live stock shall be appraised and killed by order of the Commission, it shall issue to the owner of the stock so killed a certificate showing the number and kind of animals killed, and the amount in their judgment, to which the owner is entitled, and report the same to the governor of the state, which certificate, if approved by the governor, shall be presented to the auditor general, who shall draw his warrant on the state treasurer for the amount therein stated, payable out of any money in the treasury not otherwise appropriated.

To report the same to the governor.

Auditor general to draw his warrant for amount.

How. 2136t.

Owner to be paid for animal killed.

(11.) § 5637. Sec. 11. When any animal or animals are killed under the provisions of this act, by order of the Commission, the owner thereof shall be paid therefor the appraised value as fixed by the appraisement hereinbefore provided for: Provided, The right of indemnity on account of animals killed by order of the Commission under the provisions of this act, shall not extend to the owners of animals which have been brought into the state in a diseased condition, or from a state, country, territory, or district in which the disease with which the animal is affected, or to which it has been exposed, exists. Nor shall any animal be paid for by the state which may be brought into the state in violation of any law or

Proviso.

quarantine regulation thereof, or the owner of which shall have violated any of the provisions of this act, or disregarded any rule, regulation, or order of the Live Stock Sanitary Commission or any member thereof. Nor shall any animal be paid for by the state which came into the possession of the claimant with the claimant's knowledge that such animal was diseased, or was suspected of being diseased, or of having been exposed to any contagious or infectious disease.

How. 2136u.

Disposition of domestic animal affected with any contagious disease.

(12.) § 5638. Sec. 12. Any person who shall have in his possession any domestic animal affected with any contagious or infectious disease, knowing such animal to be so affected, or, after having received notice that such animal is so affected, who shall permit such animal to run at large, or who shall keep such animal where other domestic animals not affected by or previously exposed to such disease may be exposed to its contagion or infection, or who shall sell, ship, drive, trade, or give away such diseased animal or animals which have been exposed to such contagion or infection, or who shall move or drive any domestic animal in violation of any direction, rule or regulation, or order establishing and regulating quarantine, shall be deemed guilty of a misdemeanor, and upon conviction thereof, shall be fined in any sum not less than ten dollars nor more than one hundred dollars, or be imprisoned in the county jail not less than ten nor more than ninety days, or both such fine and imprisonment in the discretion of the court, for each of such diseased or exposed domestic animals which he shall permit to run at large, or keep, sell, ship, drive, trade or give away in violation of the provisions of this act.

A misdemeanor.

Penalty.

How. 2136v.—Am. 1889, p. 145; App. May 31; Act 125.

Penalty for bringing diseased animals into the state.

(13.) § 5639. Sec. 13. Any person who shall knowingly bring into this state any domestic animal which is affected with any contagious or infectious disease, or any animal which has been exposed to any contagious or infectious disease, shall be deemed guilty of a misdemeanor, and on conviction thereof, shall be fined in any sum not less than one hundred dollars nor more than five thousand dollars, or be imprisoned in the state prison not to exceed one year, or both such fine and imprisonment in the discretion of the court.

How. 2136w.—Am. 1889, p. 146; App. May 31; Act 125.

Penalty for refusing to allow the veterinarian to examine stock.

(14.) § 5640. Sec. 14. Any person who owns or is in possession of live stock which is affected, or which is suspected or reported to be affected, with any infectious or contagious disease, who shall wilfully prevent or refuse to allow the state veterinarian or commissioner or other authorized officer or officers to examine such stock, or shall hinder or obstruct the state veterinarian or other authorized officer or officers in any examination of, or in an attempt to examine such stock, shall be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be fined in any sum not less than ten dollars nor more than one hundred dollars, or be imprisoned in the county jail not less than ten nor more than ninety days or both such fine and imprisonment in the discretion of the court.

How. 2136x.—Am. 1889, p. 146; App. May 31; Act 125.

Penalty for violation of this act.

(15.) § 5641. Sec. 15. Any person who shall willfully violate, disregard or evade, or attempt to violate, disregard or evade any of the provisions of this act, or who shall willfully violate, disregard or evade, or attempt to violate, disregard or evade any of the provisions of this act, or who shall willfully violate, disregard or evade any of the rules, regulations, orders or directions of the Live Stock Sanitary Commission establishing and governing quarantine, shall be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be fined in any sum not less than ten dollars nor more than one hundred dollars, or be imprisoned in the county jail not less than ten nor more than ninety days, or both such fine and imprisonment in the discretion of the court.

How. 2136y.—Am. 1889, p. 146; App. May 31; Act 125.

Authorized to employ persons and purchase supplies, etc.

(16.) § 5642. Sec. 16. The Commission provided for in this act shall have power to employ at the expense of the state such persons and purchase such supplies and material as may be necessary to carry into full effect all orders by it given.

How. 2136z.

May call upon the sheriff, etc., to execute orders.

(17.) § 5643. Sec. 17. The commissioners shall have power to call upon any sheriff, under-sheriff, deputy sheriff, or constable to execute their orders, and such officers shall obey

Compensation.

the orders of said commissioners, and the officers performing such duties shall receive compensation therefor as is prescribed by law for like services, and shall be paid therefor in

May arrest.

like manner. And any officer may arrest and take before any justice of the peace of the county any person found

Duty of prosecuting attorney.

violating any of the provisions of this act, and such officer shall immediately notify the prosecuting attorney of such arrest, and he shall prosecute the person so offending according to law.

How. 2136z¹.

Governor to issue proclamation prohibiting the importation of live stock, etc.

(18.) § 5644. Sec. 18. Whenever the governor of the state shall have good reason to believe that any dangerous, contagious, or infectious disease has become epizoötic in certain localities in other states, territories or counties, or that there are conditions which render such domestic animals from such infected districts liable to convey such disease, he shall by proclamation prohibit the importation of live stock, of the kind diseased into the state, unless accompanied by a certificate of health given by a duly authorized veterinary surgeon; and all such animals arriving in this state shall be examined immediately by the Commission or some member thereof, and if he or they deem necessary he or they shall have said animals inspected by the state veterinary surgeon, and if in his opinion there is any danger from contagion or infection, they shall be placed in close quarantine until such danger of infection or contagion is passed; when they shall be released by order of said Commission or some member thereof.

To be examined and quarantined.

How. 2136z^{2}.

(19.) § 5645. Sec. 19. For the purposes of this act each member of the Live Stock Sanitary Commission is hereby authorized and empowered to administer oaths and affirmations.

May administer oaths, etc.

How. 2136z^{3}.

(20.) § 5646. Sec. 20. This Commission is hereby authorized and required to co-operate with any board or Commission acting under any present or future act of congress for the suppression and preventing of contagious or infectious diseases among domestic animals, and the same right of entry, inspection and condemnation of diseased animals upon private premises is granted to the United States Board or Commission as is granted to the Commission granted under this act.

Required to co-operate with boards acting under act of congress.

Authority of U. S. board.

How. 2136z^{4}.

(21.) § 5647. Sec. 21. The Commission shall make biennially a detailed report of its doings to the governor, which report shall be transmitted to the legislature at its regular biennial session.

To report to the governor, etc.

How. 2136z^{5}.

(22.) § 5648. Sec. 22. This act shall be construed so as to include sheep and horses.

Sheep and horses included.

How. 2136z^{6}.—Am. 1887. p. 48; App. Mar. 26; Act 47.

(23.) § 5649. Sec. 23. Any railroad company, navigation company, or other corporation, or common carrier, who shall knowingly, or willfully violate, disregard, or evade any of the provisions of this act, or who shall willfully violate, disregard, or evade any of the rules, regulations, orders, or directions of the Live Stock Sanitary Commission establishing or governing quarantine, or who shall evade, or attempt to evade any quarantine proclamation of the governor of this state declaring quarantine limits, shall forfeit and pay to the people of the state of Michigan not less than five hundred dollars nor more than five thousand dollars, for each and every

Relative to violation of act by railroad companies, etc.

offense, and shall be liable for all damages caused to any neat cattle by its or his failure to comply with the requirements of this act.

How. 2136z^{7}.—Added 1887, p. 123; App. May 13; Act 105.

AN ACT to regulate and provide for the carrying, yarding and feeding of so called Texas cattle while in transit into or across this state between the first day of April and the first day of November of each year.

[Act No. 198, P. A. 1885.]

The People of the State of Michigan enact:

Transportation across yarding, etc., of certain cattle, unlawful.

(24.) § 5650. Section 1. That it shall not be lawful to transport any neat cattle into or across this state, yard or feed the same, that have been reared or kept south of the thirty-sixth parallel of north latitude, and that have not subsequently been kept continuously at least one winter north of said parallel, and which may be brought within the limits of this state between the first day of April and the first day of November, following, except in the manner hereafter provided.

How. 2136f.

Duty of railroad transporting certain cattle.

(25.) § 5651. Sec. 2. It shall be the duty of all railroad companies doing business in this state to receive and transport while in this state, the class of cattle mentioned in section one, only in cars that are branded or lettered legibly and distinctly and in plain view, the words "for the transportation of Texas cattle only;" and they shall not permit or allow any other class of cattle to enter those cars between the first day of April and the first day of November following:

Proviso.

Provided, That cattle coming from other states for transportation through this state when it is impossible to ascertain where they came from may be shipped in such cars, but shall be treated in all respects as coming from the country south of the thirty-sixth parallel of north latitude.

How. 2136g.

Care of certain cattle at stock yards.

(26.) § 5652. Sec. 3. It shall be the duty of any railroad company, stock yard company, or private individual owning and operating any stock yard in this state, to receive and feed the class of cattle mentioned in section one only in yards separate and apart from yards used for the feeding or yarding of other cattle; and these yards shall be in the immediate vicinity and contiguous to a railroad side track so that these cattle may not pass over any open common that might

Location of such yards; passing to.

be crossed by other cattle; and said yards shall have a sign posted at each entrance thereto, on which shall be plainly lettered "for the yarding of Texas cattle only," and no other cattle shall be admitted to these yards between the first day of April and the first day of November of each year. Entrance sign.

How. 2136h.

(27.) § 5653. Sec. 4. Any railroad company, stock yard company, or private individual owning any stock yard in this state, who shall violate any of the provisions of sections one and two of this act, shall forfeit and pay to the people of the state of Michigan not less than fifty dollars nor more than five hundred dollars for each and every such offense, and shall be liable for any and all damages caused to any neat cattle by their failure to comply with the requirements of this act. Penalty for violation. Fine. Liability for damages.

How. 2136i.

(28.) § 5654. Sec. 5. Any person or person [persons] who shall knowingly or willfully place or attempt to place any neat cattle, or others than those mentioned in section one, in any car or yard provided for in section two or three of this act, and branded and lettered as therein provided for between the first day of April and the first day of November following, shall be deemed guilty of a misdemeanor, and on conviction thereof shall be fined not less than ten dollars, nor more than one hundred dollars or be imprisoned not less than ten days nor more than sixty days, or both such fine and imprisonment in the discretion of the court. Certain violation a misdemeanor. Punishment.

How. 2136j.—Am. 1887, p. 64; App. April 8, Act 57.

AN ACT to prevent the infection of Foot-Rot among sheep.

[Act 166, P. A. 1879.]

The People of the State of Michigan enact:

(29.) § 5655. Section 1. That it shall be unlawful for any person or persons to allow to run at large on, or to drive along any highway in this state between the first day of May and the first day of November of each year, any sheep known to be infected with the disease known as the foot-rot. Unlawful to allow or drive on highway sheep infected with foot-rot.

How. 2136.

(30.) § 5656. Sec. 2. Any person or persons violating the provisions of the foregoing section, shall be deemed guilty of a misdemeanor, and on conviction thereof, shall pay a Penalty.

fine not less than twenty-five nor more than one hundred dollars, in the discretion of the court, in addition to the costs of prosecution; and in case the fine imposed, and the costs of prosecution shall not be paid, the defendant shall be confined in the county jail not less than thirty days nor more than sixty days, in the discretion of the court.

How. 2136a.

AN ACT to prevent the importation, running at large and sale of diseased sheep.

[Act 185, Laws of 1863.]

The People of the State of Michigan enact:

Penalty for importing, etc., diseased sheep.

(31.) § 5657. SECTION 1. That it shall not be lawful for the owner of sheep, or any person having the same in charge, knowingly to import or drive into this state sheep having any contagious disease; and any person so offending shall be deemed guilty of a misdemeanor, and shall be punished by fine in any sum not less than fifty dollars, and in default of the payment thereof, by imprisonment in the county jail not more than three months.

How. 2133.

Penalty for allowing diseased sheep to run at large.

(32.) § 5658. SEC. 2. That any person being the owner of sheep, or having the same in charge, who shall turn out, or suffer any sheep having any contagious disease, knowing the same to be so diseased to run at large upon any common, highway, or uninclosed lands, or who shall sell or dispose of any sheep, knowing the same to be so diseased, without first apprising the purchaser thereof of such disease, shall be deemed guilty of a misdemeanor, and shall be punished by fine in any sum not less than fifty dollars nor more than one hundred dollars, and in default of the payment thereof, by imprisonment in the county jail not more than three months.

How. 2134.

Damages in civil action.

(33.) § 5659. SEC. 3. Nothing in this act shall be so construed as to prevent the recovery of damages, in civil actions, against any person or persons who shall import or drive such diseased sheep into this state, or who shall allow such diseased sheep to run at large, or who shall sell such diseased sheep.

How. 2135.

AN ACT to provide for marking and branding live stock.

[Act 122, P. A. 1883.]

The People of the State of Michigan enact:

(34.) § 5660. SECTION 1. That every person who has cattle, horses, hogs, sheep, goats, or any other domestic animals, may adopt an ear mark or brand, which ear mark or brand may be recorded in the office of the county clerk of the county where such cattle, horses, hogs, sheep, goats, or other domestic animals shall be: Provided, That the mark or brand so adopted and recorded shall be different from all other marks or brands, adopted and recorded in such county.

Owners may adopt brand, etc. To be recorded. Proviso.

How. 2074a.

(35). § 5661. SEC. 2. It shall be the duty of the county clerks of the several counties of this state, to keep a book in which they shall record the mark or brand adopted by each person who may apply to them for that purpose, for which they shall be entitled to demand and receive twenty-five cents.

Duties of county clerks in recording. Fee for.

How. 2074b.

(36.) § 5662. SEC. 3. If any person shall mark or brand, or alter or deface the mark or brand of any horse, mare, colt, jack, jenny, jennet, mule, or any one or more head of neat cattle or sheep, goat, hog, shoat, pig, or other domestic animal, the property of another, with intent thereby to steal the same, or to prevent identification thereof by the true owner, he shall be deemed guilty of felony, and shall be punished by imprisonment at hard labor in the state prison, not to exceed two years, or by a fine of not more than two hundred dollars, or both, in the discretion of the court.

Penalty for changing, etc. brand.

How. 2074c.

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TWELFTH AND THIRTEENTH BIENNIAL REPORTS
(COMBINED)

OF THE

STATE

LIVE STOCK SANITARY COMMISSION

OF MICHIGAN

FOR THE

YEARS 1907—1910

COMPILED BY

THE SECRETARY OF THE COMMISSION

BY AUTHORITY

LANSING, MICHIGAN
WYNKOOP HALLENBECK CRAWFORD CO., STATE PRINTERS
1911

STATE LIVE STOCK SANITARY COMMISSION.

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REPORT OF THE MICHIGAN STATE LIVE STOCK SANITARY COMMISSION.

To the Hon. Chase S. Osborn, Governor of Michigan.

The Michigan State Live Stock Sanitary Commission have the honor to offer the following report for the quadrennial period of 1907-1910. The Statute under which we operate provides that this Commission shall make a report to the Governor of the State once in two years. At the time that the last bi-ennial report should have been made, the live stock interests of the State of Michigan were in a period of excitement such as the State had never before known. In the month of November, 1908, the States of New York and Pennsylvania were quarantined by the Federal Government because of the existence of the much dreaded "Foot and Mouth" disease. An outbreak had occurred in the New England States some years previous which was wiped out by the department of Agriculture and Michigan had escaped. We were very self-confident that it could not reach us. During the latter days of November, 1908, there came some disquieting rumors of some "unknown disease" among the cattle stock of Livonia Township, Wayne County. Reassuring letters were written to anxious stockmen that we had not and could not have the dreaded Foot-and-Mouth. These letters were written in all confidence of their correctness, but investigation followed. The results were alarming and the Federal Government was called upon to send experts. By these experts we were convinced. The Governor of the State was in the South on a much needed vacation. It seemed to be up to the Commission to move and move rapidly in the matter. The acting Governor (in absence of Governor Warner) and the Governor's private secretary gave us unlimited assurances of their co-operation. An office was at once opened in the city of Detroit in connection with the Federal offices, Dr. Green the inspector in charge at that time very kindly offered us desk room in their own offices. Two members of the Commission were on the ground almost day and night, one always being there. To complicate matters one member of the Commission, the Hon. John McKay had been elected to the House of Representatives and a new member was to be appointed in the midst of the turmoil. It was under conditions of this nature that the time arrived for the presenting of the bi-ennial report of 1907-1908. The State was still in quarantine the work of exterminating Foot-and-Mouth but half done and for aught any one knew at that time not even that. When and where it might crop out next was problematical only. What the expense might be, or where it might all end, no one could tell. In consultation with the Governor it was agreed that the report might and should be delayed. The members of the Commission had heart and hand filled to the over-flowing. By the time matters had again assumed an entirely normal condition and the files were gone over and expenses tabulated the legislature was about to adjourn and it was thought best that the extra expense of a printed report at that time need not be incurred. This is the history that explains the printed quadriennial report at this time.

In the years of Michigan's history following the reconstruction period, with the commercial and agricultural industries of the State again settling to a normal basis the live stock industry began to assume proportions that were worthy of more than passing notice. The small farmer began to cultivate it. The men of large interests to foster it, and in some cases the capitalist even began to show symptoms of desiring to flirt with this virgin enterprise. Contemporaneous with a period of business observation of this character came a farther study as to its possibilities the opportunities and the enemies of the future prospect. The possibilities seemed to be almost immeasurable.

The opportunity was at hand. The enemies seemed to be only that of contagious disease, which owing to the lack of knowledge and any plan of organized supervision, might, if once getting a foothold in a community or locality, continue its devastation without let or hindrance and be scattered broadcast over the State by careless, ignorant or vicious owners of diseased animals. Some of the Eastern States had carelessly framed and but partially effective laws looking toward the suppression of the more common maladies. The Western States were already complaining of serious invasion of disease among their domestic animals brought to them by their eastern neighbors. Prominent agriculturists of national repute were agitating the question of the passing of a Federal law establishing a National Bureau which should have governmental jurisdiction of the matter in an inter-state way looking toward the suppression of contagious and infectious disease of a malignant character among domestic animals, but notwithstanding all this agitation and cogitation on the matter the progress of contagious disease went steadily on and on unchecked in its ravages. It was not until the very early eighties that effective measures were taken looking toward the suppression of troubles of this character. At that time glanders among horses and mules had in some localities become so alarmingly prevalent that many of the more easily discouraged and pessimistic of our stockmen were readily predicting that this branch of our live stock industry was destined to be swept speedily from the boards and that the near-by future agriculturist was destined to pursue his avocation with the ox of our fore-fathers for his plow team or perchance resort to the East India custom of the aboriginees in stirring the soil by harnessing his wife to the proverbial crooked stick.

Again the continued and continual influx of southern cattle into our State that caused Splenic or so-called Texas Fever to exist in any and every community where they might choose to land, became an ever fruitful topic for the danger-scenting, trouble-loving brother who foresaw the speedy annihilation of the bovine species and was already predicting the passing of the gentle milch cow, and that the goat of the Swiss or the Persian must supplant her to supply milk for our babies or that industry be abandoned. Contagious pleura-pneumonia had for a decade or so been devastating the dairy herds of New York, New Jersey and Maryland, possibly other states as well and individuals from the infected states and in some instances whole migrating herds were slowly but surely spreading the disease westward, it having already gained a not inconsiderable foothold in Illinois and some other western states. Again the cattle man of many fears recognizing the fact that Michigan lying directly as it does in the line of traffic of the great trunk lines from west to east and from east to west, declared in all sincerity that the cattle industry was surely doomed to destruction and at a single glance it seemed as if it might be true.

Even now in the light of what has been accomplished in this direction it might not be amiss to say that had it not been for the determined efforts of both officials and laymen along the line of controlling and suppressing these and other more recently understood maladies the live stock history of Michigan might have read far differently, the results might readily have been, and might yet be as serious as the most apprehensive have feared. Michigan had already established many fine flocks of both wool and mutton producers, with the wool interests largely in the lead at that time of course, but foot rot from the close environments of the far east and scabies from the ever infected western district was causing the nervous shepherd no end of uneasiness and alarm. He too was demanding that "something be done." Hog Cholera had devastated whole districts in Ohio and Indiana and was slowly but surely working its way into Michigan, and was becoming a menace so serious that he dare not longer remain oblivious to its dangers. This then is in outline the briefly stated history of conditions prevailing in live stock circles a third of a century ago, and these very conditions and the dangers they presented to the stock breeding public were directly responsible for bringing about our present methods of restriction that have proven with time, to be as effective perhaps as any upon any set of statute books on the American continent.

To recognize a common danger is to establish a common warfare with the average intelligent American citizen. Individual farmers, stock breeders and farmers organizations began to discuss ways and means. Curative and preventative measures were exploited. The latter was at once conceded to be the only feasible plan. A commission with power, to quarantine, regulate or destroy as the exigencies of the case might seem to demand was readily agreed upon as the most likely to be productive of the ends desired. Large bodies move slowly but usually act wisely. A committee was appointed to draft a bill that might seem to embody the necessary principles of protection. The result was the drafting of two bills. In the year 1884 they were approved and endorsed at their annual meeting by every live stock association of the State, by the State Board of Agriculture, by the State Agricultural Society and hundreds of prominent agriculturalists and live stock breeders in all parts of the commonwealth. They were endorsed by both the out going and incoming executive officers of the State. The out going Governor Begole giving it especial attention in his inaugural address because as he said it could be made especially useful at just this time owing to the fact that the Federal government had by recent act of congress established a Bureau of Animal Industry. The bills were passed by the lower house practically as first drafted and without serious opposition. They were also passed by the Senate with the notable exception that the horse and sheep were exempted from its operation. This in actual operation was so plainly unjust to the horse and sheep owner and breeder of the State, that two years later they were restored to their original place in the bill. This then is the sanitary law of Michigan without important changes until the last session of the legislature, that of 1909, when a compensation clause for cattle destroyed for tuberculosis was added, and under which the State Live Stock Sanitary Commission operates, and we believe that Michigan today has as complete, protective, efficacious economical and satisfactory a live stock law as may be found on any set of statute books in America. Why do we believe this? Because of results that have been attained. What has become of our pessimistic brother of the glanders farcy period. Dead and buried together with the several hundred horses that it was found necessary to destroy in order to exterminate the disease. Glanders today while occasionally cropping out here or there, usually if not always being imported to us, is no longer feared by the people. Where is the splenic fever crank? He too is gone and with him all fear of the disease, as Michigan is today importing and slaughtering many thousands of Texas cattle and ticky cattle, but under the now established surveillance not a dollar's loss has occurred to the stock owners of Michigan by this disease for nearly a score of years. And pleura-pneumonia? Living as we do directly in the path of the cattle of commerce from west to east with three of the greatest trunk lines of railroad in existence traversing the entire breadth of our State, not a case has appeared within our borders since the present law has been in active operation. Foot rot in sheep is not prevalent and we do not longer fear it. Scabies from the west is brought to us all to frequently by the importations of the many thousands of feeding sheep, but with this we feel that we are masters of the situation and it has never made serious inroads upon the native flocks of the State. Of hog cholera alone do we own that we are not in complete control. In our ninth biennial report we predicted that its control when it came would in our opinion come in the form of an immunizing process, in a prevention rather than a cure. That this prediction bids fair to become a reality seems now to be an assured fact. Science has been laboring long and tenaciously for such an innoculation method. We believe that the essential factors are now at command of the scientist. Of the particular methods and results obtained we shall speak later under its proper head. This, however, we can now say, we have not today the desperate fear of the ravages of hog cholera that we had, ten, five or even three years ago. When we consider the magnitude of the live stock interests of Michigan and our relatively small losses from contagious and infectious diseases of a malignant character while at the same time the expenditure of money in its supervision has been less than that of almost any other State in the union having adequate sanitary laws; the ordinary man of affairs may have a modest conceit in the conclusion, as the writer concludes that the framers of the law establishing a Live Stock Sanitary Commission with its simple provisions under which they operate, "builded better than they knew," and the stock owners of Michigan may well felicitate themselves upon the efficacy of the act. Had we the time and disposition we might offer you a list of statistical evidence as long as the moral law, as impregnable as the rock of ages and as complete as the system of the universe in proof of our contention. We refrain.

DISEASES OF HORSES.

GLANDERS AND FARCY.

Of all the diseases affecting the horse with which this commission has to deal, glanders and farcy are the most serious. That these are one and the same disease in different manifestation is now so well established and universally conceded, that we shall speak of them under one head. The nature of this loathsome malady, the cause and manner of an outbreak, and the desperately fatal results following, is so well known that we shall not attempt to take it up at any length in this report. We might say in this connection, however, that should any reader be especially interested in the history and study, that the fourth biennial report of this commission treats more fully of this disease than any other of its kind, which subject matter is accompanied with cuts and illustrations of more than passing value, making it perhaps the most complete publication pertaining to glanders ever offered for gratuitous distribution. Especially interested parties may upon application to any member of this commission, be supplied free of cost. In handling this disease the commission have but one policy. It being absolutely incurable in practice, the science of materia medica not having as yet exploited any method of cure or of staying the progress of this loathsome disease when once it has established itself in an animal, and more over man himself being susceptible to its ravages, there seems to be but one safe and sane measure of dealing with it, viz: a relentless war of extermination. This warfare must be followed uncompromisingly. Until something shall be discovered in the way of a preventive or curative agent, this should be the continued policy. In ye olden times the losses from this source were not inconsiderable, but owing to the vigilance of the Federal Government in preventing the transportation of diseased animals, and the policy of immediate extermination when found in the State the losses at the present time are not so very alarming. We have no fear of their becoming so. There will of course be an occasional loss quite severe owing to the importation of an otherwise valuable horse, or perchance to a barn becoming infected and careless or ineffectual methods being pursued before the matter is brought to the attention of the commission, but in a general way the losses are not large and confined principally to horses of otherwise small value. But one otherwise valuable animal has been destroyed during the period covered by this report. A draft stallion imported into the State at a cost of more than $2,000.00 was found to be infected. The animal was not condemned until the most expert scientists were employed and every diagnostic agent known to the profession was used in confirming the physical diagnosis, and on post mortem he was found to be diseased. This but teaches that greater care must be exercised by our horse men in the purchase and importation of high priced animals. In every case of glanders, but two that have occurred in the State during this quadrennial period, it has been directly or indirectly traceable to horses brought into the State from outside and in most cases to horses carrying brands. This leads us to the conclusion that the time is near at hand when we should prohibit the bringing of range bred or branded horses into the State until they have been carefully examined by the proper State officials and found to be free from contagious disease, all expense of examination to be borne by the person or persons desiring to so bring them into the State. In the period covered by this report but eleven animals have been destroyed by order of the commission for glanders, and we have reason to think that not a case of glanders now exists in the State barring some suspected cases that are now in quarantine awaiting developments. We shall continue however so long as in office to be vigilant and if the horse owners and dealers will be prompt to report any possible infection the commission will undertake to inaugurate an investigation sufficiently thorough and scientific as to settle all controversy.

CONTAGIOUS INFLUENZA

Has given us but little concern. Three times only in this period has it been reported and in each case has yielded to proper sanitary and medicinal treatment.

DISEASES OF CATTLE.

ACTINOMYCOSIS OR LUMPY JAW.

While the commission recognizes this disease as one of a contagious or infectious nature and will continue to take cognizance of it as such. there have been no new or startling discoveries relative to it or its treatment. That it ofttimes seems to run riot in a herd, a dozen of them or an entire community and then with change of environment and conditions ofttimes lose its virulence entirely is a matter of history. Just what the pathological conditions are that will cause it to become infectious or not so, we are unable to say. When brought to our attention we shall continue to isolate and suggest treatment in the milder cases not too far progressed. In its earlier stages it ofttimes seems to yield quite readily to the iodide of potassium treatment but when the bone becomes seriously involved we believe treatment to be of little avail. Owing to the uncertainty of a positive cure and the probability of others of the bovine race becoming affected if kept in the same environments we would advise in all cases whether treated or not, that the animal if in good flesh be shipped to some Federal inspected abbatoire to be slaughtered under inspection. If fit for human food the carcass will be saved at its full value. If not it will go to the tankage vats and is better there than on any man's farm, a source of possible danger. The disease will sometimes become very prevalent in certain localities to the extent of being seemingly epidemic or epizootic, flourish like a green bay tree for a month, two, three or more until its ravages become alarming indeed, then suddenly disappear as mysteriously as it came. Owing to the uncertainty of its cure we would recommend that in all cases prompt and efficient methods be taken at once looking towards its eradication in a community or herd. The Bureau of Animal Industry in behalf of the general government have carried on some very extensive experiments looking toward the cure of this ailment. The method of treatment that has proven most efficacious by these experiments is set forth in Bulletin No. 2 United States Department of Agriculture, Bureau of Animal Industry, from which we quote:

TREATMENT FOR LUMPY-JAW.

The medicine used is iodide of potassium. The dose should never exceed one quarter dram for each hundred pounds of live weight. The proper dose being from two to three drams according to the size of the animal and the progress of the disease. This dose may be given once a day for from five to six days when the animal may show slight symptoms of iodism, viz: discharge of thick mucus from the nose and flowing of tears. The animal may become constipated perhaps but this may be easily overcome by giving a dose of glauber salts and some bran mash. This will restore the appetite and two or three days from the last dose the animal will be ready for another week's treatment, and so on until a cure is affected or the case found to be hopeless. If all the precautions are taken no ill effects should be had from the treatment and if properly fed the animal should gain in flesh uninfluenced by the medicinal treatment. There is, however, a great difference in the effect of the medicine on different animals but any farmer who takes an interest in seeing his stock do well will easily perceive when it is best for him to stop and give the animal a rest for two or three days. The medicine is best given by being dissolved in soft water and given by means of a horn or long necked bottle. One dose of the medicine, say one and one-half to two or three drams as the case may require, is dissolved in about a pint of water. Seize the animal by the nose to hold up its head and the contents may be turned down without fixing or securing the tongue in any way. The medicine is not expensive and may be procured at any drug store, and if the farmer has not suitable scales to carefully weigh out the doses he had best have the druggist put it up in proper sized powders. A large per cent of cases treated in this way if persistent enough will be cured if taken in the early stages of the disease. The treatment is well worthy of a trial. Many cases may also, we believe, be cured in the early stages before the bone becomes too badly involved, by the proper use of the knife. This, however, should be done by a man skilled in the science of veterinary surgery and not resorted to by the novice.

TUBERCULOSIS.

The subject of tuberculosis is not so easily disposed of. That we have a limited amount of this dread disease among the cattle stock of Michigan it would be futile and unwise to deny. That we have anything like as large a percentage of tuberculous cattle as some alarmists would have us think, is in our opinion a most fallacious belief. There is no reliable data from which general conclusions may be drawn. The percentage of losses among the cattle tested by this commission would not be anywhere near a reliable criterion from which to draw conclusions because we make no tests except where the disease is known or where there is strong reasons to believe the disease exists. The slaughter record of the Federal inspected abbatoirs of the State would be a vastly more reliable criterion from which to draw conclusions. If this be true then it is safe to say that less than two per cent of the cattle stock of Michigan are affected. That the per cent of dairy animals so affected is greater than this however, there can be little room to doubt. Since the writing of the last report of this commission, the legislature of the State in its wisdom provided for a partial compensation for tuberculous cattle destroyed under the supervision of the Commission. That this was a step in the right direction we most heartily believe. When they shall see fit to increase the amount that may be allowed it will, we believe assist in bringing from cover the diseased brutes. At the present time the maximum appraisal for a single animal is $50, only fifty per cent of which is paid by the State. If this valuation was increased to say a possible $70 on unrecorded animals and $100 on recorded animals and two-thirds of the appraisal value paid by the State, we believe the cost would be very nominal indeed and the benefit derived by bringing to light those animals that should be destroyed, would much more than compensate and in the long run be an economy to the State at large. If the public is to benefit by the destruction of the diseased animals the public should be and we believe are willing to help stand the loss. This however is a matter for the legislature and you Governor Osborn to consider. The law under which we operate never contemplated a general tuberculin test by the State. It would be utterly impracticable and perhaps not even desirable. The commission can only hope to care for emergency cases at best, and attempt to assist and protect where the disease is known or strongly suspected of existing. The general elimination of the disease must come when it does by the active co-operation of the breeder and live stock owners in each and every community. By the exercising of community interests and the banding together of individual breeders for self-preservation. Michigan is perhaps less infested with tuberculosis than almost any other State of like cattle interests. Dairying is making rapid stride in our State and the dairy will have a tendency to increase the spread of the disease because of the all too often abnormal and unsanitary conditions existing in the average dairy barn, because of the long tenure of office of the dairy cow, because of the lack of interest and knowledge of the dairyman because of his too often indifference to consequences and lastly but not leastly because of the hauling of the whole milk to the creamery or skimming station and the indiscriminate return of the skimmed produce to the farm without sterilization. This practice should in our opinion be prohibited by law. At the present time the commission stand ready to help out in any emergency case and offer such assistance and advice as it may be able from its experience. We believe that every animal reacting typically to the tuberculin test properly and carefully applied, will be found to be tuberculous on a careful post mortem. That it does occasionally happen that a tuberculous animal does not respond to the tuberculin test owing to a lack of potency in the material used or some other unknown cause seems to be equally well proven.

As a diagnostic agent however for determining the presence of disease it is a witch and a wizard and no other agency, diagnostic of any disease of domestic animals, is so far as we are informed, to be named in the same breath with it. It should be utilized in every case where there is a reasonable suspicion that trouble exists. Since the taking of effect of the compensation law Sept. 1st, 1909, the following animals have been condemned with the appraisals as set forth:

Nine animals at $40 each	$360 00
Forty-four animals at $50 each	2,200 00
Seven animals at $35 each	245 00
Two animals at $30 each	60 00
Two animals at $25 each	50 00
One animal at $20	20 00
One animal at $10	10 00
Total	$2,945 00

Of this appraisal one-half was paid by the State.

Amount paid by the State, $1,472.50.

Not such a fearful sum for one and one-half years of protection is it now, and the alarmists would have made us think that the passage of a compensation law would surely bankrupt the State in short order. We believe it was a wise and judicious expenditure of money and repeat that we believe that the maximum appraisal allowed should be increased in the interests of all the people and economy.

BLACK QUARTER OR SYMPTOMATIC ANTHRAX

Has given us very little trouble indeed during the period under review. One outbreak only has appeared in the State. This by prompt treatment was subdued at once and but three animals were lost. The symptoms of the disease are now so well known and the preventive treatment by the use of the anti-black leg vaccine so effective that we do not believe serious losses will occur or need occur. This vaccine can or may be administered by any handy stock man or an experienced veterinarian may be employed. The material may be secured from the Bureau of Animal Industry or through the regular channels of the drug trade and no owner of cattle should hesitate to act promptly at the very first manifestation of the difficulty. That the disease may be readily recognized by the layman who may first be brought into its presence we might add, perhaps should add that the symptoms of the disease are as follows: loss of appetite, lack of rumination, animal is staggering in gait, quickly exhausted and usually tender to the touch along the back, stiffness of the legs when standing, ofttimes with arched back. Eyes usually sunken with copious flow of tears, mouth will likely fill with mucous and blood may flow from the nose. Gas will form under the skin in blotches of various sizes along the back and sides from which a crackling sound will emanate when the hand is brushed lightly over it.

The animal is usually easily excited and oftentimes the gentlest animal may become really dangerous to approach. Death usually follows from about six to twenty hours from the time the first symptoms appear. Anthrax is a disease known under different names among which are black leg, black quarter, black tongue, etc., which include a group of diseases very virulent and malignant appearing in different forms externally and internally and attacking the different species of lower animals and even man himself in an enzootic or sporadic manner according to the influences that produce it or whether it is gotten by innoculation. It sometimes seems to arise spontaneously in low damp rich pastures and along the banks of overflowing streams or where ponds have been drained off or dried up the soil containing a large amount of organic matter. It has been claimed that long continued warm dry weather forming the emenations of organic matter and miasmatic gasses form its development.

FOOT-AND-MOUTH.

In the annals of the live stock industry in Michigan probably no invasion of disease has caused so much wide spread alarm as when it became definitely known that the fatal, insiduous and treacherous Foot-and-Mouth was on our soil. At the first rumbling of the crash that was so soon to be upon us we were inclined to reassure all that it was impossible that Foot-and-Mouth could get into Michigan, My Michigan. To be sure New York and Pennsylvania were already in quarantine and the Federal Government were making almost superhuman efforts to trace it to its fountain head and eradicate the disease but of course *we* did not, *could* not have it. To Dr. Samuel Brenton of Detroit, should be given credit of first sounding the alarm, and being a very conservative scientist as he always is, he did so with the utmost quietness. The Commission not for a moment thinking they would really find themselves in the presence of Foot-and-Mouth, but having so much respect for the good doctor's opinion and with all knowing his conservatism at once met in the city of Detroit to confer with him. Dr. Green, the inspector in charge of the Bureau of Animal Industry in Detroit and also Dr. Geo. W. Dunphy who for years was a most efficient State veterinarian were also in the conference. The results were that the Federal Government were asked to send experts to determine the nature of the disease that existed. Perhaps not a scientific man then in the State of Michigan had ever seen a case of the disease. They were familiar with it, if at all by the literature only. On November 23rd, 1908, Doctors Eichorn and Durfee of the Federal forces were sent to Michigan, were taken to the suspected herds and at once pronounced it the real thing. On the 24th the Hon. Secretary of Agricultural Wilson and Doctor A. D. Melvin chief of the Bureau of Animal Industry were in consultation with the Commission in the city of Detroit and on the 25th the State was in quarantine by the Federal Government. Not an animal of the ruminant family coud be moved from the State. The Live Stock Industry was paralyzed. We could not well demur for we were surely guilty. We were caught with the blood on our hands. An agreement was entered into with the Honorable Secretary of Agriculture whereby the business of eradication was to begin at once. We had not men skilled in this inspection work but the Federal Government had. More than this they were as anxious to help us from our difficulties as we were to have them do so. A working agreement was soon established whereby the Federal Government would furnish all the skilled veterinarians required without cost to the State in any manner whatsoever. This seemed exceedingly liberal on the part of the Secretary. It was agreed that every herd in which a single trace of the disease was to be found would be exterminated regardless of the number of animals affected or the extent of the invasion. That it was too dangerous a disease to play with. Regardless of the number or value of the animals comprising the herd, they must go and go at once. It was agreed that the animals would be appraised by the Commission and that two-thirds of the appraisal value would be paid by the Federal Government and one-third by the State of Michigan. In all condemnation of property other than live stock that might be found expedient or necessary the same ratio of payment was to be maintained. Forty or more expert scientists were put at work of inspection by the Secretary of Agriculture under the direction of a most efficient manager. As soon as a herd was located in which the disease was found the Commission made the appraisals and the Federal forces proceeded to destroy all cattle sheep and hogs on the premises infected.

Four days from the time that Dr. Eichorn first pronounced the disease Foot-and-Mouth, every animal that was ever found in the State infected with this disease was under ground and one of those days was the public holiday known as Thanksgiving day. The sacredness of this day, however, did not stop the business of eradication. The indirect loss was in many cases almost immeasurable and the conditions of hardship that it brought about were such as to cause the stoutest heart to quail, but it was and is believed that the exigencies of the case required most heroic treatment. So efficient and thorough were the Federal inspectors in their work that not a case of the disease ever cropped out after them. After many days of careful and laborious investigation the authorities both Federal and State became convinced that the outbreak in our State was confined to the counties of Wayne and Oakland. The holding of the entire State in quarantine was working untold damage and losses to the feeding and shipping interests everywhere. The Commission were trying their very best to relieve such parts of the State as were sufficiently far removed from the infection as to make it entirely safe and expedient. We made the proposition to the Honorable Secretary of Agriculture that in the event that he would remove the Federal quarantine in the balance of the State that the Commission would undertake to maintain and defend the quarantine lines around such territory as he deemed necessary to hold. He stated to us frankly that if we would elect to maintain and *could* maintain without cost to the general government, the quarantine on Oakland, Macomb, Washtenaw, Wayne and Monroe counties that he would release the balance of the State. He farther frankly admitted, however, that he doubted our ability to do it and should the attempt prove a failure the entire State would again be plunged into a tie-up that no one could predict its duration. We accepted the trust and on December 24th, twenty-nine days from the first embargo upon our live stock traffic all but five counties were again free to come and go without let or hindrance. This of course at once relieved the congestion and was of immense value even to those in the still restricted district as they were unable to supply sufficient live stock for the regular slaughter of the city of Detroit and matters in the live stock world again began to assume normal conditions. Here then was the problem confronting the commission, two hundred miles of line to defend and maintain or go back to cover with the entire State. Did we do it? Read history. And the expense. We were told that it would cost vast sums of money to make even a semblance of maintaining such line, but did it? The commission conceived the idea of securing the co-operation of the farmers and stock owners along the line of demarkation. Of sending a man or men along the line, posting the notices at every cross road, leaving a copy with every farmer and resident and by personal solicitation secure if possible the promised co-operation over his or her own signature of such residents. Four men were employed with this work. These men were Lester S. Clark of Denton, Oel Smith of Romeo, Harry J. DeGarmo of Highland and John Wanty of Milan, every one of whom were known by the commission to be men of reliability and integrity. They were paid but $5.00 per day furnishing their own rig and paying their own expenses. With them it was a work of loyalty to their own interests for every one of them were live stock owners and breeders. A moment's study of the expense account which will be hereafter attached will show the exact cost of the patrol. The method of procedure will perhaps be more fully understood by the publication here of the letter of instruction prepared by the Commission for the use of the patrolmen. It was as follows:

INSTRUCTIONS TO PATROLMAN.

Drive as near to quarantine line as possible and keep to public highway. When necessary to deviate take road *outside* of the quarantine line. See every man living on the quarantine line or some representative member of his family. Take his name, address, etc., filling in all questions as per blanks in your possession. If it becomes impossible to see the man or some member of his family get his name and address from some neighbor that this office may correspond with him. Ask every man on the line to co-operate with us by reporting on the addressed postal cards which you will leave with every family, any infringement of the law or quarantine regulation. If he refuses, do not leave cards but write the word "no" in the "will he assist" column of your notation sheet. If you fail to see the man at all make an X in that column. Get over the line as rapidly as you can reasonably and be entirely thorough with your duties. Send report to this office each day. Post the quarantine notices on all corners where public highways may cross the quarantine line. Leave a paper copy with each resident visited. Post notices at any conspicuous places you may pass, i. e. country stores, blacksmith shops, villages, etc., etc. Also state to every man visited that a reward of $25.00 is offered for information that will lead to the arrest and conviction of any person violating the quarantine regulations. State to those who live just outside the line that if they hope to retain the present modification of the Federal quarantine that it can only be done by a rigid enforcement of the present order and that we are depending upon *them* to assist in maintaining it. Tell those who are just inside that if they wish ever to get out it will be only by the rigid maintenance of these same regulations. Make it very plain to them that unless we, the State of Michigan can and do maintain this line that the entire State will again come under the ban of the Federal government and the restrictions would in that case no doubt stay on for a long, long time. Make this plain to every man, woman and child whom you meet in your travels. Let them understand that it matters not if there is justice, "rhyme or reason" in the regulation, that it is *here* and that we must and will obey it. That the State Live Stock Sanitary Commission will undertake to defend this line if it takes ten regiments of soldiers to do it. We expect, however, that all the soldiers we shall need will be the loyal residents along the line. We are placing instructions with all constables, sheriffs and sheriffs forces to enforce these regulations and they can not, must not be evaded. Report often and ask for any farther information you desire.

Yours very sincerely,
THE STATE LIVE STOCK SANITARY COMMISSION.
Per (Signed) C. A. TYLER,
Secretary.

As to the results we have but to state that the officers of the department of Agriculture expressed themselves as eminently satisfied. In that entire line of two hundred or more miles but three men refused to cooperate with us in the matter and but three violations were made. These were promptly prosecuted and convicted in the local courts. Perhaps no demonstration of the loyalty and progressiveness of the farmers and live stock breeders of Michigan can be offered that would be more conclusive or more to their honor than this. When we remember that no part of the State of New York was released from quarantine by the Federal Government until Jan. 24th, we feel that Michigan had reason to congratulate herself on the results. The Governor of the State upon his return expressed himself as fully satisfied with the manner and method of procedure. On Jan. 27th, 1909, the quarantine was so modified as to cover only the counties of Oakland, Macomb and Wayne and four townships on the east side of Washtenaw.

Three weeks later this was again modified to cover only four townships in Macomb, seven in Oakland and twelve townships and the city of Detroit in Wayne. The Sanitary Commission maintained their office in the city of Detroit in connection with the Bureau of Animal Industry until about March 1st., as the work of eradication seemed to be accomplished. On March 15th the last vestige of the embargo was removed from the State, barring a very modified one on a half a dozen sections in the heart of the original outbreak in Livonia township. This then is the history briefly told of Foot-and-Mouth in Michigan. How much the indirect loss to the live stock interests of the State because of the Federal embargo will never be known as it would be impossible to estimate. Suffice it to say that it would mount high in the thousands of dollars. That the State of Michigan was under quarantine for a less number of days than any other State having the disease within her borders and that she was the first to have the difficulty, that she had more cases than any other but two and that the direct cost to the State was so infinitesimal almost as compared with the other States having any number of cases is now a matter of history. Such exaggerated reports have been sent broadcast as to the exact cost to the State and such almost incredible sums were expended by some of the States that we are inclined to include an itemized report of the exact cost as expended by this Commission and drawn from the State treasury. A careful notation will aid

in grasping the magnitude of the task and will help, we believe, in establishing a most wholesome respect for the men who were responsible for giving us so efficient and beneficent a law under which may be handled contagious and infectious diseases of a malignant character among the domestic animals of the State. The expense list is as follows:

	Award.	Government.	State.
Shaw Bros. & Wilson, 55 cattle destroyed	$825 00	$550 00	$275 00
Eddie Pankow, 12 cows and 2 hogs	688 00	468 67	210 33
Ira Wilson, 73 cattle, 11 hogs	1,458 00	972 00	486 00
Chas. Herschleib, 7 cows	350 00	233 34	116 66
John M. Shaw, 13 cattle, 1 sow, 7 pigs	229 00	152 67	76 33
Fred Pakes, expert appraiser, one day expenses			7 61
B. F. Taggert, expert appraiser, 2 days and expenses			14 02
Geo. B. Cornell, 14 cattle killed	500 00	333 34	166 66
Robert Bredin, 8 cattle, 2 hogs	445 00	296 67	148 35
Parke Davis & Co., 1 cow, 9 sheep, 3 goats	109 00	72 67	36 33
John H. Pickering, 1 cow	60 00	40 00	20 00
Geo. W. Dunphy, 3 cattle	75 00	50	25 00
Shaw Bros. & Wilson, 53 cattle	795 00	530 00	265 00
Rent on typewriter (machine) three months			9 00
Incidental expense Detroit Office			10 00
Chas. F. May, printing			48 75
John Bornman & Son, printing			46 25
Lester S. Clark, patrol 11 days			55 00
Oel Smith, patrol 11 days			55 00
H. J. DeGarmo, patrol 11 days			55 00
John Wanty, patrol 5 days			25 00
Lester S. Clark, patrol (new line) 11 days			55 00
Eddie Pankow, excavation and burying animals	38 00	25 53	12 67
Parke Davis & Co., excavation and burying animals	90 88	60 59	30 39
J. F. Pickering, property destroyed and labor	9 38	6 26	3 12
Parke Davis & Co., property destroyed and labor	68 10	45 40	23 70
Eddie Pankow, property destroyed and labor	121 23	80 82	40 41
Hulburt Leslie, property destroyed and labor	2 00	1 33	67
Robert Breden, property destroyed and labor	24 50	16 34	8 16
Robert Breden, property destroyed and labor	102 74	68 50	34 24
Chas. Herschlieb, property destroyed and labor	20 75	13 83	6 92
Chas. Herschlieb, property destroyed and labor	124 80	83 20	41 60
John M. Shaw, property destroyed and labor	33 50	22 33	11 17
Harriett I .Blue, property destroyed and labor	150 00	100 00	50 00
John M. Shaw, property destroyed and labor	79 56	53 16	26 60
Shaw Bros., labor	21 88	14 59	7 20
Geo. Cornell, labor	39 13	26 09	13 04
Geo. Cornell, labor	52 50	35 00	17 50
Ora Wilson, labor	89 51	59 67	29 84
Ora Wilson, labor	100 00	66 67	33 33
Ora Wilson, labor	75 00	50 00	25 00
Ora Wilson, labor	69 75	46 50	23 25
Frank Leach, conviction 3 violations			75 00
C. A. Tyler, Secretary, salary and expenses			475 54
H. H. Hinds, President, salary and expenses			503 92
John McKay, Member Commission (Nov. 20th to Jan, 1st)			167 67
T. F. Marston, Member Commission (After Jan. 1st)			36 50

By a careful study of these figures and those reporting the expenses and expenditures of other States it will be seen that Michigan escaped very easily indeed. In this connection it will not be amiss to say that too much credit can not be given to the most excellent force of the Bureau of Animal Industry and the thorough and courteous manner in which their work was done.

CONTAGIOUS OPTHALMIA.

Has given us but little concern during the period covered by this report. Such outbreaks as we have had are invariably the result of importations of western cattle who seem to be, somewhat immune from any very great distress from its infection but when our native cattle take it from them it seems to be more virulent in its form and to produce far greater and more disastrous results. Persons buying western cattle should be very careful indeed to make note of their condition in this respect and should there be the slightest evidence of the presence of this malady the animals should be kept rigidly isolated from all native cattle until such time as the disease has been most carefully treated and fully eradicated. Treatment is not difficult and entirely effective. That the disease may be more readily recognized by the novice and the proper treatment taken up at once we will take the liberty of quoting from the report of Dr. Geo. W. Dunphy, who was then State veterinarian as carried in our eighth biennial report. In speaking of contagious opthalmia Dr. Dunphy says, "the disease consists of more or less violent inflammation of the delicate membrane lining the eyelids and of the transparent tissue which constitutes the cornea or front of the eyeball. The inflamation in many cases is so intense that it involves all the structure of the eye and in such cases causes adhesions and total blindness. The disease is undoubtedly caused by some microorganism although the germ has not yet been positively identified. There is no doubt however, that it is highly contagious and whatever the causative agent it seems to be rapidly transmitted from animal to animal either by direct contact or by contact with infected places or possibly through the air. The first symptoms resemble the ordinary simple opthalmia, consisting of the swelling of the eyelids and a congested condition of the conjunctiva and a flow of tears. In the latter stages a deposit forms between the two coats of the eye and the cornea becomes white and opaque. The discharge from them becomes so sticky and albuminous as the disease progresses, and assumes the character of a creamy looking pus. The sunlight seems to have a very painful effect on the eye and the afflicted animals suffer very much to all appearances when exposed to the light and are inclined to seek dark or shady places that are not exposed to the sun's rays. I have noticed cases where the cornea had ulcerated and perforation had resulted and the whole contents of the front chamber of the eye had run out and the eye was thus completely destroyed. Inquiry into the history of these cases showed that the disease varied in different cases from ten days to three weeks and I am inclined to believe that with rational treatment a complete recovery would result unless ulceration of the cornea takes place. The progress of the disease should be checked as quickly as possible by the early isolation of the affected animals and a thorough disinfection of the premises where they were kept such as watering troughs or stables if the animals were housed. Animals under treatment should be placed in a darkened stable and warm water with mild antiseptics and anodynes used. We can not too strongly condemn the pernicious practice of using such irritants as burned alum or spitting tobacco juice into the eye of the afflicted animal, and I am inclined to believe that some of the disastrous results in animals that I have inspected have come from this cruel and filthy practice."

We are very glad to place the author of this report as among the most competent of his profession in the State and his suggestions are worthy of the most careful consideration by any stock owner who may be so unfortunate as to have this trouble with his cattle.

HYDROPHOBIA-RABIES.

In a previous report the compiler took occasion to say that while rabies had not become alarmingly prevalent in the State it was to be congratulated that such was the case as it seemed little short of marvelous that we had so fortunately escaped serious invasion from this dread scourge. Since writing the above the expected has happened and rabies has been prevalent and caused very serious losses in not less than a dozen counties most of which have been or are under quarantine for more or less of the time. The time will come in the judgment of this commission when the Federal Government will have to take this "bovine gentleman" (rabies) by the horns and throttle him. We believe it will be necessary to muzzle every dog in the Union to accomplish this result. Small areas of quarantine zone, however, thorough the work may be or well regulated the particular quarantine, will not accomplish the desired results as the rabid dog is at once nomadic, becomes a rambling arab and may create havoc fifty miles from his legitimate home. That some such action as this should be taken one has but to watch the reports of the daily newspapers when almost daily reports of the loss of valuable animals and human life as well is reported from this much dreaded and little understood agency. This Commission have been called upon from many parts of the State to take measures that would assist the local authorities in stamping out the disease. When the local authorities have taken active measures to restrict the spread of the maladie pending the arrival of the Commission it has usually been confined reasonably close to its initial quarters. The method of handling this difficulty is to rigidly quarantine or securely muzzle every dog in the suspected territory under the supervision of the supervisors of the several townships until such time as the extent of the invasion may be fully established or the absolute correctness of the diagnosis be established when every dog positively known to have been bitten by a rabid canine will be destroyed. It has not been the policy of the Commission to order the destruction of the other domestic animals even though strongly suspected of having been bitten by a rabid dog as not all such develop the disease but should they show symptoms, or when they do show symptoms of the disease they may then be destroyed to save them several days of intense suffering as death is inevitable. While it is no doubt a scientific fact that rabies *may* be contracted by one domestic animal other than the dog, to another, perhaps the horse or the pig might inoculate his neighbor also the cow and the sheep could you induce them to bite or otherwise inoculate an open wound, or plant their saliva on some abrasion of the skin, the present Commission are ready to say that never in their observation of many years standing and in hundreds of cases has the disease been conveyed by any other animal than the dog and we therefore believe him to be the only source of serious danger, with the possible exception of the domestic cat and tabby being a nimble lass is likely to take to the back yard fence or a convenient cherry tree when the rabid dog is abroad and from this vantage ground she will sit and spit defiance at her tormentor until he goes his way and tabby is saved from the contagion. Should there be a reasonable suspicion, however, that she has been bitten then by all means destroy her at once for by her domestic nature and disposition to become the pet and companion of the children she would be doubly dangerous should she become infected with the malady. In a supplement to the State Board of Health for 1895, we find the following which is so applicable and with all so sensible that we shall take the liberty of quoting it verbatim as we have done before. Before giving this quotation, however, we feel like saying that in the interests of common humanity, having seen fatal results follow too long delay in taking the pasteur treatment, if a human being is bitten by an animal that may even be reasonably supposed to be rabid do not delay for a single moment in getting such person to the hospital and Pasteur treatment at Ann Arbor. Remember always that *delays are dangerous* and that only by prompt and sensible methods will the person be saved a most painful and horrible death. Again we say *do not delay.*

RULES AND REGULATIONS SHOULD BE FRAMED AND PUBLISHED.

One of the most efficient means employed for the restriction of the spread of rabies is a set of rules which shall regulate the action and movement of animals infected with the disease. Each local board of health should frame and publish (in accordance with the State laws) rules which would enable the health officer to act promptly upon the appearance of a case of this disease so dangerous to the public health and life. If a health officer is obliged to wait until the local board can be called together the disease may have been allowed to spread instead of restricting it to the first case. On the occurrence of a case of rabies the fact should be reported to the local health officer and promptly restricted by him in accordance with act 137, laws of 1883. The health officer should, in compliance with sections 5 and 6, act 125, laws of 1889, report the fact to the Live Stock Sanitary Commission. The local health authorities should isolate the animal or animals and keep them so until they are taken care of by the State Live Stock Commission or State Veterinarian; but under no circumstances should the local health authorities fail to guard the public health and life. Whether in man or animals the full fact regarding the outbreak of the disease should be reported to the secretary of the State Board of Health at Lansing. In the cities the "dog ordinance" generally regulates the actions of animals most likely to be infected with rabies. Every city should be equipped with an efficient ordinance and should demand its strict enforcement. An ordinance may be ever so efficient, but if not enforced is useless, and the stray and ownerless dogs will be permitted to roam about the cities to become infected with rabies and transmit the disease to human beings. For the restriction of the spread of rabies and hydrophobia, it is important that prompt action should be taken with any suspicious animal. When a dog or other animal acts strangely and there is suspicion of madness, the animal should be immediately confined, not killed and kept under observation for a week or ten days. Have the animal examined by a competent physician or veterinary surgeon, and if the animal is rabid the characteristic symptoms will soon be observed. Pasteur says the animals will certainly die within eight days. If at the end of that time no symptoms of rabies have been observed the bite cannot cause hydophobia, and there is no reason why the animal should be destroyed. If symptoms of rabies do appear in the animal thus under observation, it should be immediately killed. And, if the animal has bitten a human being, a small portion of the medulla oblongata should be secured and placed in a small vial containing pure glycerine only, for use in experimental inoculations of other animals to determine without doubt whether the animal suspected of rage was really rabid. If other animals have been bitten by a suspicious animal they should likewise be confined until it is proven whether or not they are rabid, or until the period of incubation has passed. It is quite frequently the case that valuable stock has been bitten by animals not rabid, and it would be a useless destruction of property to destroy such animals. Do not kill an animal unless you have good reason to believe it is rabid, or unless it is a source of danger to other animals and to human life. Of course a dog may run mad when it is quite impossible to secure the dog, and extremely dangerous for it to run at large, where shooting the animal may be the only safe way. In such a case the animal should not be disposed of until it is absolutely certain that no person has been bitten. If a person has been bitten a portion of the medulla should be prepared as described above. If a human being has been bitten and the animal is destroyed there is no other way left to ascertain whether or not the dog was really mad, and whether the person bitten has been inoculated with the virus of this terrible disease.

If precautions as above outlined are taken, we do not think any unusual apprehension need to be felt in regard to rabies.

DISEASES OF SHEEP.

Of the disease of sheep there are but few that cause us much alarm or discomfort. Foot-rot, the old time bug-a-boo to the sheep man has almost entirely disappeared from our State and its method of treatment is now so well known and with all so efficacious that it is now, when found the sure sign of the indifferent flock master. But two infected flocks have been brought to the attention of the commission during the period under observation. These were easily and quickly cared for and we fear it not.

The stomach worm of which the strongylus contortus is perhaps the most damaging to Michigan flocks is again the sign of a poor shepherd or of careless conditions of environment. Its prevention is far more satisfactory than its cure, but the latter is better understood and vastly more effective than it was a few years ago. Frequent change of pasture, discontinuance of the practice of using permanent pasture for sheep and the access at all times of the sheep to tobacco dust will prevent. This is better by far than a cure as the appearance of the stomach worm in the flock is sure to cause much loss in thrift, growth and usefulness if the actual loss of life even is prevented. If you find, however, that your flock is infested, treatment should begin at once. Delays may mean the loss of several valuable animals and is sure to mean much loss in value of the entire flock. The cresol-gasoline and milk treatment will be found most effective we believe in the eradication of the worm. The strongylus contortus inhabits the fourth stomach of the sheep and while it ofttimes does not cause particularly serious disturbances in the vigorous adult sheep we feel that we are safe in saying that it has caused greater financial loss among the lambs than that of all other diseases of sheep combined. These parasites may be found adhering by their heads to the mucus membrane of the stomach. They are of a reddish color and feed principally, we are told, upon the blood of the animal. These little worms when present in large numbers ofttimes appear like masses of threads from one to one and one-half inches long. If the animal has been killed for examination the worms may be seen wriggling and squirming in all directions and the writer has even found them in balls as large as a hen's egg. Their presence in large numbers causes great weakness, considerable fever, which may be detected by the unusual thirst of the animal and ofttimes aggravated diarrhea will follow their invasion. A dropsical swelling under the chin is ofttimes, usually seen. The eyes, lips and tongue will be very pale. The animal loses appetite, mopes around, is as we said very thirsty consuming large quantities of water if able to get it and contrary to the usual tendencies of the dainty little sheep, seems almost to prefer to drink from a filthy, stagnant pool rather than a sweet clean trough. The blood becomes pale and watery. The parasites do not always develop rapidly and their presence may not be discovered by the careless and indifferent flock master until one or more fatalities have occurred. If you have done nothing until this actually happens your losses, directly and indirectly will surely be large. Again we repeat prevention is the watchword and eternal vigilance the price of success.

SCAB.

The time is now at hand when the scab question in Michigan is getting to be a serious one. The native flocks of Michigan do not carry the disease except as they have become infected by the admixture of some western stock or have been placed in the environments occupied by them. The bringing of western sheep into our State to fatten upon our surplus of highly nitrogenous foods has been and is a large and profitable business. More than four millions of dollars has been paid by the sheep feeders of Michigan in a single year for feeding stock. Any thing that strikes at this industry strikes at a vital spot in our live stock and agricultural economy. That the scab mite of the west does so strike is a fact that may well cause us some uneasiness. When the matter is promptly reported to the commission there is usually but little trouble in cleaning it up or confining it to its initial quarters, but in so many cases the trouble becomes well disseminated among the farm sheep in a neighborhood, through ignorance, carelessness or cussedness and sometimes a combination of all three of these characteristics, and when this is the case the matter becomes more serious. The position that this commission is now taking however, is that when scab once enters the sheep fold, no sheep from that fold goes out until it goes out to die. To complete a perfect cure is not an impossibility, but in actual practice with the methods at command our experience is that the *farmer does not and will not cure it.* It is not at all difficult, and the average farmer for his own protection will do this, to cure it sufficiently to pass muster in the slaughtering pens, but to clean up the sheep so they will stay clean, to clean the pens, the fences, the ranch, the racks, the quarters and everything that pertains to the sheep economy of the place is not so easy a matter and the average man won't do it, don't do it. The Federal Government is always ready and willing to lend a hand in this eradication process by furnishing an expert man to assist and direct the work of dipping and it is always best for the farmer who has been so unfortunate as to get "soaked" to seek their help. We are ready to say from our observation that you will not get clear if you don't. No temporary half-hearted methods will prevail. The only remedy is dipping, dipping, dipping. Spraying and hand treatment will help some but will not destroy the infection. Clean environments after the first, second and third dippings are as essential as the dipping itself. Two, three, four or a dozen dippings will never suffice if you are compelled to put the sheep back into the same infected quarters. Do not under any circumstances fool away your time with any but a government approved dip. All such dips will have the words "approved by the United States Government" printed on every can. If you do not find this on the can, do not use it but get some other that has. The unapproved may do, the approved surely will do the business. Lime and sulphur is affective and cheap but it also destroys the life of the wool and is pretty severe on the sheep themselves. Happy is the flock owner who has not yet made the acquaintance of sheep scab but that he may readily recognize it when it makes its appearance in his flock we hereby append a clipping from the Bulletin No. 21, United States Department of Agriculture, a careful reading of which will make the discovery and diagnosis of sheep scab a comparatively easy matter even for the inexperienced flock master, and here is hoping that this may prove as intimate an acquaintance as you may ever be called upon to make with this mighty little tyrant Psoroptes Communis. You will never love him. He does not bear acquaintanceship well. He is an undesirable citizen and we shall hail the day when he may be banished from our commonwealth.

DESCRIPTION OF SHEEP SCAB.

COMMON SCAB, BODY SCAB, OR PSOROPTIC SCAB.

Although the symptoms of common scab are familiar to most farmers, they will here be briefly reviewed.

The mites of common, or body scab—that is Psoroptes—prick the skin of the animal to obtain their food and probably insert a poisonous saliva in the wound. Their bites are followed by intense itching, with irritation, formation of papules, inflammation, exudation of serum, and the formation of crusts, or scabs, under and near the edge of which the parasites live. As the parasites multiply they seek the more healthy parts, spreading from the edges of the scab already formed, thus extending the disease. The sheep are restless; they scratch and bite themselves, and rub against posts, fences, stones, or against other members of the flock. This irritation is particularly noticeable after the animals have been driven, for the itching is more intense when the sheep becomes heated. The changes in the skin naturally result in a falling of the wool; at first slender "tags" are noticed; the fleece assumes the condition known as "flowering;" it looks tufty or matted, and the sheep pulls out portions with its mouth; or leaves tags on the objects against which it rubs. Scabs fall and are replaced by thicker and more adherent crusts. The skin finally becomes more or less bare, parchment-like, greatly thickened, furrowed and bleeding in the cracks. With shorn sheep, especially, a thick, dry, parchment-like crust covers the greatly tumified skin. Ewes may abort or bear weak lambs.

Parts of Body Affected.—When sheep are kept in large numbers the chances for infection are naturally greater, and the disease may begin on almost any part of the body. Generally, however, it affects the parts which are covered with wool. When the sheep are fat and the wool has a large amount of yolk, the progress of the disease may be slow; usually beginning on the upper part of the body, withers and back, it extends slowly but none the less surely, and in ever-increasing areas, to the neck, sides, flanks, rump, etc. In two or three months the entire body may be affected.

Contagion.—Common scab is exceedingly contagious from one sheep to another, and may in some cases show itself within about a week after healthy sheep have been exposed to infection. The contagion may be direct, by contact of one sheep with another; or indirect, from tags of wool, or from fences, posts, etc., against which scabby sheep have rubbed. or from the places where the sheep have been "bedded down." One attack of scab does not protect sheep from later attacks.

Chances of Recovery.—Cases of apparent spontaneous recovery are rare. Usually when proper methods of treatment are not adopted the disease increases, leads to anæmia, emaciation, exhaustion and death, and may result in a loss of from 10 to 80 per cent of the flock. Scab is favored by seasons when the wool is longest, and by huddling or overcrowding the animals; also race, energy, temperament, age, state of health, length, fineness of and abundance of wool, and the hygienic conditions of the surroundings influence the course and termination of the disease. Young, weak,closely inbred animals, and those with long, coarse wool will most quickly succumb. Unhealthy localities, damp climate and poorly ventilated sheds favor the disease. Pure or mixed Merino sheep succumb sooner than certain other breds. The mortality varies according to conditions, but is highest in autumn and winter. When owners are careless the death rate may be very high; if untreated the sheep may die in two or three months. Hygienic conditions, good food and cool, dry atmosphere tend to check the disease. Sheep sheds should accordingly be well ventilated and open to light and sunshine. With proper attention to hygienic conditions and thorough dipping, a positive cure can be guaranteed.

Vitality of the Parasite.—Taken from the sheep the mites possess a remarkable vitality. It is generally stated that, kept at moderate temperature on portions of scab, the adults may live from four to twenty days, but they will occasionally live much longer; cases are on record where they have lived three, four, or even six weeks when separated from sheep; if the atmosphere is dry they will generally die in about fifteen days; but death is often only apparent, for the mites may sometimes be revived by warmth and moisture even after six or eight weeks; the fecundated females are especially tenacious of life. Various, rather contradictory statements may be found regarding their resistance to cold. Krogman states that they may live at a temperature of minus 10° C. (+14° F.) for twenty-eight days. Other authors claim that the mites die in two hours at 47° F., still other authors, that they die at 50° C. (122° F.) They are said to have been kept alive in cold water for six days and in warm water for ten days. Several authors admit, however, that the parasites are usually killed by a soaking rain; though it is claimed that in damp, dark stables they "may live for months."

Experience has shown that in some cases apparently healthy sheep have become infected in places where no sheep have been kept for four, eight, twelve or even twenty-four months. The conditions underlying this infection are not thoroughly understood. Possibly some of the eggs have retained their vitality a long time and then hatched out; possibly the vitality of the fecundated female has also played a role; while it is not at all improbable that an entirely new infection has accidently been introduced by birds or other animals. Certain authors of high standing scout the idea that birds can introduce an infection of scab, but there is no reason why birds should not do this, and there are some reasons for believing that they do. It has been noticed on the Experiment Station of the Bureau, for instance, that crows delight in perching on the backs of scabby sheep and picking at the scab. While so doing it is only natural that small tags of wool should adhere to their feet, and thus scatter scab. The fact that snails cling to birds' feet and are carried long distances is too well established to need discussion, and it is very probable that many of the cases where sheep are supposed to have become infected with scab on pastures which have not been occupied for one or two years are in reality cases of fresh infection by means of birds. From the data at hand, while it may be admitted that in some cases, under favorable conditions, the mites may live from spring to fall, it is scarcely within the limits of probability that either the scab mites or their eggs will live through a winter when separated from the sheep and exposed to the elements.

All matters connected with the vitality of the scab mite have an important bearing in explaining cases of indirect infection on roads over which scabby sheep have been driven, or in fields and sheds where they have been kept. From the facts now at our disposal we can lay down the following important rules:

(1) Scabby sheep should never be driven upon a public road; (2) sheds in which scabby sheep have been kept should be thoroughly cleaned, disinfected and aired, and should be left unused for at least four weeks (better two months) before clean sheep are placed in them; (3) fields in which scabby sheep have been kept should stand vacant *at least four weeks* (better six or eight) before being used for clean sheep; (4) a drenching rain will frequently serve to disinfect a pasture, but it is well to whitewash the posts against which scabby sheep have rubbed. Even

after observing the precautions here given it is not possible to absolutely guarantee that there will be no reinfection, but the probabilities are against it.

Life History of the Parasite.—A study of the life history of the scab parasite is necessary in order to determine several important points of practical value, such as the proper time for the second dipping, etc.

The female mite lays about 15 to 24 eggs on the skin, or fastened to the wool near the skin; a six-legged larva is hatched; these larvæ cast their skin and become mature; the mites pair and the females lay their eggs, after which they die. The exact number of days required for each stage varies somewhat, according to the writings of different authors, a fact which is probably to be explained by individual variation, and by the conditions under which the observations and experiments were made. Thus Gerlach, in his well-known work (1857), estimates about fourteen to fifteen days as the period required for a generation of mites from the time of pairing to the maturity of the next generation. He divides this time as follows: Under ordinary conditions the eggs hatch in three to four days, although two authors allow ten to eleven days for the eggs stage; three or four days after birth the six-legged larvæ moult and the fourth pair of legs appears; this fourth pair is always present when the mites are two-thirds the size of the adult; when seven to eight days old the mites are mature and ready to pair; several (three or four) days are allowed for pairing; another generation of eggs may be laid fourteen to fifteen days after the laying of the first generation of eggs. Without going into all of the other observations on these points, it may be remarked that the eggs may not hatch for six or seven days; the six-legged larvæ may moult when three to four days old, and become mature; after pairing a second moult takes place, lasting four to five days; a third moult follows immediately, then eggs are laid and the adults die; in some cases there is a fourth moult, but apparently without any further production of eggs. Accepting Gerlach's estimate of fifteen days as an average for each generation of ten females and five males, in three months' time the sixth generation would appear and consist of about 1,000,000 females and 500,000 males.

Several practical lessons are to be drawn from these figures: First, it is seen that the parasites increase very rapidly, so that if scab is discovered in a flock, the diseased sheep should immediately be isolated; second, if new sheep are placed in a flock, they should either first be dipped, as a precautionary measure, or they should at least be kept separate for several weeks to see whether scab develops; third, since the chances for infection are very great, the entire flock should be treated, even in case scab is found only in one or two animals; fourth, as dipping is not certain to kill the eggs, the sheep should be dipped a second time, the time being selected between the moment of the hatching of eggs and the moment the next generation of eggs is laid. As eggs may hatch between three and seven (possibly ten or eleven) days, and as fourteen to fifteen days are required for the entire cycle, the second dipping should take place after the seventh day, but before the fourteenth day; allowing for individual variation and variation of conditions, the tenth, eleventh or twelfth day will be the best time to repeat the dipping.

IMPORTANCE OF PROPER USE OF DIP.

Whatever dip is selected, the farmer should not forget that there are two ways to use that dip. One way is to prepare and use it in accordance with the directions given; the other way is to attempt to economize time, labor, or money by using the dip in weaker proportion than advised, by hurrying the sheep through the swim, or by later placing the dipped sheep under unfavorble conditions. If the former method is adopted with any of the established dips, the treatment ought to be followed with favorable results; but if the latter method is adopted, the farmer himself must assume the responsibility of failure, no matter which dip he decides to use. Every farmer should therefore remember that when he has decided upon the dip he is to use his work is only begun; to use the dip properly is fully as important as to use a dip at all.

The Pastures.—In case it is necessary to place the dipped sheep on the same pastures they occupied before being dipped, it is always best to use a dip containing sulphur. If a proprietary dip is selected under those circumstances, it is suggested that sulphur be added, about 1 pound of flowers of sulphur to every 6 gallons of dip. In case it is possible to utilize fresh pasture after dipping, the use of sulphur is not so necessary but it is always advisable. The object in using sulphur is to place in the wool a material which will not evaporate quickly, but will remain there for a longer period of time than scab parasites ordinarily remain alive away from their hosts. By doing this the sheep are protected against reinfection.

NECROBACCILLOSIS-LIP AND LEG ULCERATION.

The troublesome lip and leg ulceration that has caused so much havoc in the sheep folds of the range country or much of it in the far west has made but little trouble in Michigan. On a few different occasions it has been imported to us from the west but in each case it has yielded very readily indeed to treatment and it does not seem to become particularly malignant in this State and might perhaps disappear entirely without treatment under the most favorable environments and conditions. It has not as yet so far as we know been communicated to our native sheep and what the results might be in such a case is not yet known. It is well indeed to take every precaution to prevent such a condition as it might like others of those western and southern maladies prove far more troublesome on the native animals than it does with the sheep on which it is imported to us. We do not think, however, that the flock masters need have cause for serious apprehension along this line if they will exercise all reasonable precaution to prevent its introduction to the farm sheep of the State.

HOG CHOLERA AND SWINE PLAGUE.

Hog Cholera has undoubtedly been the cause of greater financial losses to the farmers of the state than all others of the animal diseases combined. Its ravages are not confined to any particular locality, season, condition or breed. It seems to be absolutely no respecter of persons. In previous reports this commission have been wont to say that of Hog Cholera alone did they stand in complete awe absolutely impotent to cure, prevent or successfully relieve. We have also stated that the remedy when it came would in our opinion come as a preventive and not a cure. It would seem that this prophecy is now in the early stages at least of becoming true, of its entire fulfillment we have faith. It would seem to us today that Hog Cholera is in a large measure at least to be robbed of its fealful toll, its desperate horror.

For years scientific gentlemen in this and other lands have been experimenting with immunization processes, to discover if might be, some method by which this desperately fatal contagion might be prevented. It seems now to be in tangible form. The Bureau of Animal Industry has recommended it and the Bacteriological laboratory at M. A. C. are preparing the serum and virus necessary to employ either the serum alone or the simultaneous method of immunization. This Commission in conjunction with the college authorities have made some field experiments. Many others have been made with which the Commission have not been a part. Some have been most highly successful, others have been total failures. The successes outnumber the failures by many times. We believe that there is much to learn yet regarding this method of treatment. Wé believe it will be learned. We believe the failures will grow beautifully less as experience and additional knowledge is gained. At the present time the cost of the serum is something of an obobstacle to its greater use but this may, probably will, be reduced by improved discoveries as time goes on. The Live Stock Breeders' meeting at its last annualy session passed a resolution unanimously endorsing a reasonable appropriation by the present legislature to partially defray the expense of making the serum that its use might become more general in the prevention of the spread of the disease, Hog Cholera. We most heartily endorse this resolution. We believe it would be money well spent in the financial interests of the State at large. As we write we have before us a copy of a little bulletin issued by Dr. Marshall of the M. A. C. laboratory than whom there is no more thorough scientist giving accurate directions for the use of this serum and also telling how it may be obtained. It is so concisely and plainly told and with all from the standpoint of the scientist himself, that we have asked and obtained permission of the good Doctor to reproduce it as we believe the more publicity it can be given the sooner will the checking of hog cholera obtain.

DIRECTIONS FOR USING HOG CHOLERA SERUM AND VIRUS.

INTRODUCTION.

Serum and virus are prepared by the Bacteriological Laboratory of the Michigan Agricultural Experiment Station for the treatment of hogs for the prevention of hog cholera.

The Bacteriological Laboratory does not recommend "Hog-Cholera Serum" as a curative or remedial agent for hogs already suffering from hog cholera. Laboratory does recommend the use of "Hog Cholera Serum and Virus," prepared according to the method used by the Bureau of Animal Industry, as the only known preventive of hog cholera. Nothing is guaranteed. Michigan farmers must base their decision to use or omit the use of "Hog Cholera Serum and Virus" upon its merits as established by field tests. (See contract.)

"Hog Cholera Serum" is a preventive of *hog cholera* only. It can not be expected to prevent hogs from dying or becoming sick from any other infection than that of *hog cholera* or from the disorders caused by intestinal or other parasites. "Hog Cholera Serum" can not replace proper care and feeding of swine or save hogs from dietary troubles other than those caused by the *virus of hog cholera.*

The following directions and precautions must be carefully observed in order to avoid bad results for which the serum and virus should not be held responsible.

METHOD OF TREATMENT.

"Hog Cholera Serum" or "Hyperimmune Serum" is the blood drawn from cholera-immune hogs that have been hyperimmunized or treated with large quantities of hog-cholera virus subcutaneously or intravenously. This blood is defibrinated or whipped to remove the clot and contains a small amount of carbolic acid as a preservative. It contains no living germs capable of producing an infectious disease in hogs. It should be kept in a cool (30°-40° F.), dark place where it will retain its potency for some time.

"Hog Cholera Virus" or disease-producing blood is blood drawn from hogs killed at a certain stage of the disease. It is secured only at the laboratory under aseptic and antiseptic conditions, defibrinated and stored in sterile vessels at a low temperature. It rapidly undergoes putrefaction at room temperature and should not be used after it is several days old. It should be used immediately upon its receipt and any portion not used should be mixed with a disinfecting solution and the vessels containing it washed with a disinfecting solution.

There are two methods used in treating hogs for the prevention of hog cholera, viz: the "Serum-Simultaneous Method," and the "Serum Alone Method."

"Serum-Simultaneous Method:" Each pig is injected according to the methods described below with the proper doses of "Hog Cholera Serum" and "Hog Cholera Virus." The injections are made "simultaneously" or at the same time before the pig is released. This method is used in herds in which the disease does not exist or where the disease has just started. Pigs treated by this method are immune for six months to one year or perhaps for life. The method is not dangerous as a rule, but it is attended with greater danger than the "Serum-Alone Method." However, the resulting immunity is much longer than in the case of the "Serum-Alone Method" and the additional expense is not to be considered. Pigs that show an elevation of temperature or any other symptoms of hog cholera, or pigs that have been exposed to infection longer than one or two days are treated by this method at some risk.

"Serum-Alone Method:" Each pig is treated with the proper dose of serum *only*. This method is to be used in herds where the disease already exists and is to be used on healthy pigs only. The earlier in the outbreak it is used, the greater the number of animals that may be treated with prospects for a successful outcome. Pigs already sick will probably not benefit by its use. Many pigs, apparently well, but already infected with the disease germs, can not be saved by the use of serum, although a number of them may be saved. Serum alone may be used on pigs that it is desired to show at fairs or other public places for a short time where they may be exposed to infection. However, the "Serum-Simultaneous Method" is recommended for all healthy pigs. The "Serum-Alone Method" is in no way dangerous to the treated animals or to those associated with the treated. It is followed by a very short period of immunity lasting only one to three months.

Neither method is, as a rule, followed by any unfavorable symptoms, except a slight, transitory stiffness in the hind legs, and possibly a slight fever and lack of appetite for a short time, provided the animals were sound when treated.

DIRECTIONS FOR TREATING PIGS.

The following instruments and apparatus are required for treating pigs by the "Serum-Simultaneous Method:" (See Fig. 1.)

(A) Bottle of serum: covered dish for holding serum (a clean, tin-cover jelly tumbler will answer), a hypodermic syringe with cc. graduations, capacity 50-60cc.

(B) Bottle of virus; covered dish for holding virus (smaller than that used for serum); a hypodermic syringe with cc. graduations, capacity 5-10 cc.; a dish of disinfecting solution and cloth.

For treating pigs by the "Serum-Alone Method" only the materials mentioned under (A) are required.

PREPARING HERD FOR TREATMENT.

Separate the well from the sick or those to be treated from those not to be treated. If possible, mark in some way all those treated or all those not treated so that the results of the treatment may be accurately estimated. The pigs to be treated should be separated according to weight in pens or enclosures, all those requiring the same dose of serum being placed together.

HOLDING THE PIGS.

The attendant holds the pig by the hind legs with the snout toward the ground and the inside of thighs or hams exposed to the operator. (See Fig. II.)

Pigs weighing less than 100 lbs. can be easily held in this way. Larger hogs may be thrown on the back with the hind legs spread apart and held securely. Hogs weighing over 200 or 300 lbs. can be treated while standing by inserting the hypodermic needle into the muscles on the inside and back portion of the ham approaching the hog from the rear. An assistant holds the hog firmly by the tail. A "hogholder" or rope with slip-noose may be placed over the hog's upper jaw, the rope being then snubbed to a fence post. The treatment is not painful to the pigs which usually cease resistance while the injection is taking place.

TABLE OF DOSES FOR SERUM AND VIRUS.

NOTE.—The serum from a number of hogs is mixed and tested thoroughly before sending out. Such a mixture of blood is designated thus: Mixed serum No.....

The virus is secured from the pigs sick of hog cholera and is numbered according to the pig from which it is drawn, thus: Virus No....., or Virus Experiment No..... The doses of different batches of serum and virus will vary only slightly. A maximum and minimum dose is given and when each serum and virus is sent out, directions will accompany whether to use the maximum or minimum dose.

Weight of pig.	Dose of serum.	Dose of virus.	
		Minimum.	Maximum.
Sucking pig	15 cc.	.5 cc.	1. cc.
30 –50 lbs	20 cc.	1. cc.	1.5 cc
50– 75 lbs	25 cc.	1.5 cc.	2. cc
75–125 lbs	30 cc.	2. cc.	
125–175 lbs	35 cc.	2. cc.	
175–225 lbs	40 cc.	2. cc.	
225–275 lbs	45 cc.	2. cc.	
275–325 lbs	50 cc.	2. cc.	
325–375 lbs	55 cc.	2. cc.	
375–425 lbs	60 cc.	2. cc.	
425–475 lbs	65 cc.	2. cc.	
475 lbs. and larger	70 cc.	2. cc.	

Do not underestimate the weight of pigs for the sake of saving the price of a few cc. of serum. There is much danger in using too little serum; little danger in using too much.

Place the apparatus during the treatment where it will be readily accessible, free from dirt, and free from danger of destruction by farm animals running wild.

Do not use *serum* for *virus* or *virus* for *serum.*

Use separate syringes for *virus* and *serum.*

Measure *serum* and *virus* in the syringe accurately for each hog. The syringes used should be previously tested with water to determine whether they are discharging the proper amounts.

When injecting material, plunge needle deeply into the muscles on inside of thigh (See + in Fig. II) perpendicular to the skin and avoid striking a bone. Inject the large volume of serum slowly and steadily, and, when removing the needle, place the finger over the point where the needle enters the skin, thus temporarily preventing return of serum through the puncture wound. Do not try to inject the material just under the skin as is customary in hypodermic injections.

Use a slip needle of rather small caliber.

NOTE—Needles are frequently broken off in the flesh and should be removed when possible, i. e. when they can be secured before becoming buried under the skin. A local abscess usually results upon failure to remove a broken needle.

Make it a practice to inject serum on the left side and virus on the right side so that, if local trouble results, it can be attributed to its proper source.

In case of leakage due to stoppage of needle or other causes, be sure that the proper amount of serum and virus is introduced before the pig is set free.

It is well to wipe off the point of inoculation of the virus with a cloth dipped in disinfecting solution after injection.

Permanent separation of sound from affected animals and thorough disinfection of premises are advisable, but not mandatory.

The price of serum and virus at present is at the rate of two cents per cc. for serum and one cent per cc. for virus.

Do not fail to make out contracts in duplicate, filling in all blanks and adding any details of interest. Return one contract, report once each week as to results, and address all communications to,

BACTERIOLOGICAL LABORATORY,
East Lansing, Michigan.

All in all we feel that much has been accomplished by the scientific gentlemen of the country in combating Hog Cholera during the last four years. We are hoping that other and still greater discoveries by way of some knowledge of more certainly determining the exact power or potency of the material used and also it is hoped that some method may be exploited that will make it possible to produce a satisfactory serum more cheaply. At the present time it is a somewhat expensive process but when you are in the presence of an epidemic of Hog Cholera we most fully believe that it is worth the cost to experiment and may be will save you many, many times the expense incurred. The laboratory will assist you in every possible way and we believe that you may usually save your herds if you begin in time even in the event of a most virulent scourge in your neighborhood. In a recent local paper the compiler saw an article written by Dr. Ward Giltner, pathologist at the Michigan Agricultural College and the man who has had really more to do with the actual making and using of Hog Cholera serum in Michigan than any other, which article was so aptly and tersely written from the standpoint of the scientist and with all in a language so simple and delightful that the plainest of us are able to grasp it stating the situation so nicely that we have asked his permission to reproduce this letter and it has been granted us. The letter or article is as follows:

THE HOG CHOLERA SITUATION IN MICHIGAN.

BY PROFESSOR WARD GILTNER OF M. A. C.

Hog cholera, like the poor, we have always with us. Fortunately, though, it has been in large measure robbed of its terrors. While it cannot be said that the end of hog cholera is in sight, it has been clearly demonstrated, not only in Michigan but in many of the foremost hog raising states, that the loss of any considerable portion of the herd from cholera is due to inexcusable neglect or ignorance. It is now just as much an established fact that the Dorset-Niles hog cholera serum will prevent hog cholera in sound pigs as it is that susceptible pigs will contract hog cholera when sufficiently exposed to the infection.

Readers of the agricultural press and the experiment station publications are familiar with the methods of manufacture and the nature of hog cholera serum. It cannot be said that the laboratory workers engaged in its manufacture or the field agents engaged in its application throughout the country have met with no reverses. A tale of uninterrupted successes with hog cholera serum would be at variance with the history of other biological products designed for the prevention or cure of human or animal plagues.

Farmers engaged in swine production want the truth in regard to the prevention of hog cholera by serum treatment. Briefly, then, the truth is this: Hog cholera kills a large percentage of hogs, especially young ones, in every herd attacked, unless proper precautions are taken toward prevention. There is no agent that can be relied upon to cure hog cholera, hence PREVENTION is the ONLY ALTERNATIVE. The history of the swine industry in both Europe and America shows that the ordinary methods of quarantine, isolation and disinfection are inadequate to meet this big problem—in other words, we are not yet prepared to give directions that will surely keep hogs from contracting the disease through sanitary measures. There is only one means known to us by which a farmer may retain his hogs safely in the presence of hog cholera, and this is by treating them with hog cholera serum prepared by the Dorset-Niles method.

The Dorset-Niles serum, as made by the various state laboratories, is a preparation based upon scientific principles. It is a fact that the blood of an immune pig, that has been properly treated with a sufficient volume of blood from a pig sick with hog cholera, will acquire the property of protecting a susceptible pig against hog cholera infection. A complete explanation for this phenomenon cannot be given. We understand very poorly the nature of hog cholera virus and, consequently, all that pertains to hog cholera serum production. The above stated fact, nevertheless, is incontrovertible.

We must enlarge upon the assertion that a protective serum can be produced against hog cholera. This seems desirable in order to help explain why the campaign against hog cholera has not been more fruitful since now for over two years a preventive of hog cholera has received such reliable endorsement.

In the first place, the production of hog cholera serum is complicated by many difficulties. There are so many factors involved, and each so hard to control. The difficulty in getting suitable pigs for the work, and their inordinately high price, the expense of thoroughly testing all the serum before sending it out, and the frequent lack of potency of serum even when all the requirements of the process seem to have been fulfilled—these influences and others militate against the production of serum that will answer the requirements of availability, efficiency, safety, ease of application and, above all, cheapness.

Efforts made to produce a satisfactory serum or vaccine based upon radically different methods of serum application have met with discouraging results. It seems to be for the interests of the swine breeders that we continue our policy of developing and improving the hog cholera serum along the lines pursued since the inauguration of the work. Our confidence in the efficiency of the serum has been shared by many of the most extensive swine breeders of several states.

Efforts toward rigorous testing of serum and the use of only that of high potency are expected of a public laboratory where the matter of profit is not necessarily a serious consideration. Even under the control of a public laboratory, if the bare expenses of serum production are to be met by the sale of the product, the price of the serum seems prohibitive to the average swine raiser. Our observations lead to the opinion that those who use hog cholera serum are not only farmers but, very keen business men who, having once used it in the presence of danger continue to do so under similar circumstances. It is not a difficult proposition to sell a "sure cure" to a farmer whose mental state is upset by the impending danger of an uncontrollable plague wiping out his capital invested in his herds. To receive, however, the repeated and unsolicited patronage of careful business men who have had ample opportunity to test the qualities of an expensive preventive serum is a measure of success.

A sound, theoretical plan for state-wide control of hog cholera, involving the use of hog cholera serum, has been worked out by scientists interested in the problem. Whether such a plan should be given a practical test with State aid and supervision is a subject for the livestock men of the State to consider. Those engaged in studying the disease are ever ready to co-operate when the farmers themselves mean business."

While we are ready to most heartily endorse all the doctor has said in his article still we wish you to remember the old precautionary methods are still in style. Keep your swine quarters as clean and sanitary as possible. Be mighty careful how your traffic in hogs if there is an outbreak of Cholera in the same county with you. Use lime and carbolic acid as a disinfectant in plenty. Remember always that a well developed, well fed, well grown pig with a good digestion and plenty to digest, a strong constitution and ample exercise is much better able to withstand the attacks of disease than is the pig that is in a weakened condition and with an ill fed stomach. In spite of all this, in spite of all the precautions you may take, in spite of all the sanitary conditions you may surround yourself it will sometimes happen that Hog Cholera will invade your premises. If disease is within reach of your herd and under the present knowledge of immunization you have failed to avail yourself of its privileges we can only say you have not quite our sympathy as you would had you used the means at your command to ward off the blow. The old government formula to be used in the feed as a preventive and that has seemed in many cases to have been useful is as follows:

Wood charcoal	1 pound.
Sulphur	1 pound.
Sodium sulphate	1 pound.
Antimony sulphide	1 pound.
Sodium bicarbonate	2 pounds.
Sodium chloride	2 pounds.
Sodium hyposulphite	2 pounds.

These ingredients should be completely pulverized and thoroughly mixed.

Dose, one large tablespoonful of the mixture once a day for each 200 pounds weight of the hogs to be treated. The medicine should be given in soft feed, as corn meal or ground oats, or crushed wheat mixed with bran or middlings well moistened with hot water.

In closing this report we wish to thank the Bacteriological laboratory in general and Drs. C. E. Marshall and Ward Giltner in particular for the prompt, cheerful and able manner in which they have responded to the call of the farmer or the Commission in time of trouble. Much good has been accomplished by it. We wish also to thank the very many able veterinarians in the State who have responded in time of need, coming to the rescue when ofttimes it was to their own disadvantage to do so, but with that loyalty to the needs of their State that is most commendable, indeed. We wish them one and all to know that we appreciate it, and again we should feel that we were derelict in duty did we fail to acknowledge the very many splendid services rendered the State by the Federal forces of the Detroit Station Bureau of Animal Industry. To Drs. Green and Mullowney we can scarce say enough in our appreciation. Offering their office as they did to us "without money and without price," offering so cheerfully to donate desk room and office room that the State and Federal forces might the more easily co-operate during the strenuous times of foot-and-mouth rendering service with their trained and skilled forces when and where most needed, offering advice and counsel on most intricate subjects. Traveling long distances at unseemly hours and most disagreeable weather, always ready and willing and cheerful, a combination that is as rare as it is delightful. To you, gentlemen, Dr. Green, Dr. Mullowney and every man of your several forces we doff our hat, make our bow and say again we thank you most heartily. Many things have been accomplished that we should know not how to accomplish without your valuable and scientific aid. Michigan is in your debt and here is hoping that she may pay it by furnishing you happy homes for many long and useful years. As a whole we believe Governor Osborn that you will find the Live Stock interests of Michigan in a flourishing condition, with as little if not less disease than any other state whose interests are of like magnitude.

All of which is most respectfully submitted.

Commission of 1907-1908.	Commission of 1909-1910.
HENRY H. HINDS,	HENRY H. HINDS.
COMFORT A. TYLER.	COMFORT A. TYLER,
JOHN McKAY.	THOS. F. MARSTON.

FOURTEENTH BIENNIAL REPORT

OF THE

STATE LIVE STOCK SANITARY COMMISSION

OF MICHIGAN

FOR THE

YEARS 1911 AND 1912.

BY AUTHORITY

LANSING, MICHIGAN
WYNKOOP HALLENBECK CRAWFORD CO., STATE PRINTERS
1913

STATE LIVE STOCK SANITARY COMMISSION.

MEMBERS OF THE COMMISSION.

H. H. HINDS, President,	STANTON
H. H. HALLADAY, Secretary,	CLINTON

STATE VETERINARIAN.

WARD GILTNER, D. V. M.,	EAST LANSING

REPORT OF THE MICHIGAN LIVE STOCK SANITARY COMMISSION.

FOR THE BIENNIAL PERIOD OF 1911 AND 1912.

To the Hon. Woodbridge N. Ferris, Governor of Michigan:

The Michigan Live Stock Sanitary Laws were enacted in 1885. They have been amended to some extent during the last twenty-eight years as experience indicated it desirable but no revolutionary or striking changes have been adopted during the time that this class of legislation has been on our statute books.

The Commission wrote this in its First Biennial Report; "The Commission desire to say that in the pursuit of their duties as laid down in the laws under which the Commission was created, they have not had the advantage of following the precedents established by better men, who had preceded them. This class of legislation is new to this State and practically new in this country. The Commission have been compelled to meet all questions presented to them, affecting the health of our domestic animals and apply to their solution their best business judgment. They have acted in all cases promptly and without standing upon the order of their going, waiting for neither daylight, wind nor weather, and have been both stormbound and wrecked in pursuit of their duties." After years of extensive experience and with this class of legislation obtaining almost universally in the United States, the above general statements written twenty-six years ago carried in the First Biennial Report of the Commission may be written in its Fourteenth Biennial Report.

During the closing hours of the 1885 legislative consideration of the enactment of this class of laws and in deference to the wishes of a small minority of the Legislature, horses and sheep were exempted from the provisions of this law. Early in the hours of the succeeding Legislature two years afterwards, the provisions of this law were made to include horses and sheep.

While the general law, we are discussing, was given immediate effect, the companion enactment providing for the handling of so-called Texas cattle, that is cattle infested with the destructive southern tick, was not given immediate effect, and therefore, for the entire season of 1885 the Commission was unable to place any check upon the destructive effect of that particular bovine affection, although from the time of the passage of this act until it became operative, the Commission noted the fact that more than 200 cows, valued at over $10,000, and mostly the property of poor people, died from this cause in Detroit alone. The provisions with reference to the handling of Texas cattle above referred to, that is, cattle reared south of the 36th parallel of north latitude, that had not been previously wintered north of that parallel, became fully operative in 1886. The Commission, therefore, adopted rules and regulations for the driving of that class of cattle from the stock yards in Detroit to the slaughtering houses scattered about the city, describing exact streets and parts of streets over which same should be trailed, and directing owners of native cattle to not permit their cattle to travel or feed along any of those lines of streets. These rules and regulations were printed upon large placards in three different languages and posted conspicuously along the entire lines on which these disease carrying cattle were handled. The Commission also had a representative steadily on the ground to see, as far as practicable, that these rules were fully observed. As a result, four cows only, died with this disease in the City of Detroit in the season of 1886, and in each of these four cases the Commission were able to show that the owner of same had deliberately driven his cow over portions of the lines set apart for the handling of Texas cattle only, permitting his cattle to graze upon the luxuriant pasture at the street side as he passed along. While thousands of this class of cattle have annually been slaughtered in Michigan, from that date to the present, in a field covering many of the large cities of the state, the maintaining of rigid regulations as to the handling of same has resulted in fully protecting the owners of Michigan cattle from the loss of a single dollar from this cause. What losses have occurred have been caused by carrying companies neglecting to observe proper regulations and the damages have been in every case paid by the railroad, which was at fault.

As before noted, for the first two years of the activities of this Commission, it had no jurisdiction over diseases of horses and sheep. When the health of those domestic animals were placed under the jurisdiction of this Commission, in attacking glanders, that loathsome and always fatal disease, which is spread only by the equine species and to which man himself is susceptible, it found the infection most extensively distributed throughout the state. In fact, during the first three or four years of the Commission's attack on the disease it destroyed horses affected with glanders in the counties of Allegan, Alcona, Antrim, Bay, Branch, Cass, Calhoun, Crawford, Chippewa, Clinton, Delta, Genesee, Gogebec, Hillsdale, Huron, Ionia, Ingham, Jackson, Kalkaska, Lenawee, Macomb, Mason, Mecosta, Menominee, Midland, Montcalm, Monroe, Muskegon, Oakland, Oceana, Otsego, Sanilac, St. Clair, Tuscola, Van Buren, Washtenaw, Wayne and Wexford. In some of these counties glanders were found in several different townships. Persistently following out the policy that the Commission thus early adopted of destroying all horses and mules, which it determined were infected with glanders and its companion disease, farcy, with a different development, this disease was many years ago effectually eradicated in this state, and in recent years a case of glanders is really a curiosity in Michigan, and always when encountered, it is found to have been imported from some other state.

Upon taking up the work of contagious diseases of a malignant character among sheep, it was found that scab, the tabooed sheep disease of the world, was extensively present in this state, and that foot-rot existed to an alarming extent in all counties carrying much of a sheep census, particularly among merinoes and fine wool sheep on account of the peculiar soft and growthy condition of their hoofs. Foot-rot was vigorously handled and early eradicated and is now but seldom imported to the state. On the other hand, in relation to scab, which in any particular case more readily yields to proper treatment than does foot-rot, and under the vigorous policy pursued by the Commission it is every year practically cleaned up in the state. We annually import sheep by the tens of thousands and many of these sheep are either carrying the infection when imported or develop it later on, from exposure in transit in the great commercial stock yards of the country. Our Michigan farmers annually feed hundreds of thousands of western sheep and lambs to great financial advantage to themselves and to the general benefit of the agriculture of the state. Instead of preventing the introduction of scab by prohibiting the importation of sheep to this state, which might easily be done by quarantining against other states, this Commission steadily fights the disease as imported and annually cleans up the infection. In the great feeding barns of the state where many of these feeders are placed upon arrival at the point of destination, are there fattened and then go from the barns directly to market, no great trouble is experienced in controlling the infection. But when it is imported with breeding sheep or escapes to a farmer's breeding flock of sheep from an infected bunch of feeders, it is a much more serious proposition. As an illustration of some of the extreme cases along this line, it may be stated that two different groups of capitalists developing the range conditions of some of the northern counties of the Lower Peninsula, imported unusually large bands for Michigan of breeding ewes in a single importation, in one case amounting to over five thousand breeding ewes and the other case a few years later amounting to more than eight thousand five hundred breeding ewes, in each of which cases scab was later developed although both of these great bands of sheep arrived in this state in splendid thrift and condition and apparently free from any infection. Of course the cleaning up and closing out of these two large propositions took some time and involved considerable financial loss to the unfortunate owners of this stock. In a somewhat lengthy communication in connection with extensive correspondence with the Department of Agriculture and its Bureau of Animal Industry and touching more particularly one of the large importations above referred to as becoming scab infected enroute to the state, under date of June 19, 1911, the writer among other things said: "In the southeast portion of the county of Ogemaw and in the environments of the village of Prescott is a case of scab infection that, so far as the balance of Michigan is concerned, in relation to scab, is in a class by itself. There is nothing in the situation there, however, but what this Commission has been in the presence of before, and has always cleaned up the infection and will do so in this case by the final annihilation of the entire sheep of the outfit and absolutely prohibiting the introduction of sheep on the same ranch for an entire season, which is a sufficient period, in our experience, for the ranch and range to become naturally disinfected. The history of this Prescott outfit briefly is as follows: An extensive ranch interests carrying thousands of sheep and covering large areas, all under wire however, a couple of years ago imported from New Mexico a band of 8,000 to 10,000 breeding ewes in a single shipment. These sheep landed in Michigan in fine condition and apparently in perfect health and with no appearance of infection. In the long journey they had taken they passed through some large feeding and stock yards where they became exposed to scab as many other importations do in passing the large feeding and stock yards in the environments of Chicago or elsewhere. This band of sheep developed scab. This investment in sheep and other ranch property is a large one. The investors have not had the experience in dealing with scab that this Commission have had. They finding that this stock were infected, availed themselves of extensive literature upon the topic and secured other information upon the subject and spent a considerable amount of money in arranging modern plants for dipping and presumed that they might and probably would eradicate the disease. It coming to the knowledge of this Commission that this fine band of sheep had developed scab, they at once quarantined the outfit, this quarantine still being in full force and effect and will remain in effect until these sheep all hit the trail for the slaughter house, which will be at no very distant date. The state live stock sanitary laws of this state are ample when properly handled by a competent Commission to wipe out scab infection of sheep as often as it may be introduced. * * * * Let me state here and now to the Department of Agriculture for the information of its Bureau of Animal Industry that barring the Prescott outfit, the state of Michigan will have less scab on its map on the first day of next July than it ever had at any corresponding date since the organization of the Live Stock Sanitary Commission more than a quarter of a century ago. I also desire to state, without the fear of successful contradiction, that the records of the movement of sheep from the state of Michigan will show that no scab has ever got away from the state yet to injure the sheep of commerce. All of the scab exported from Michigan has gone to slaughter. No sister state has been damaged in the slightest degree in this way. It is the policy of the Commission, and has been for some time past, to have all of this stock slaughtered in the state. In the course of traffic it breaks out in some of our feeding barns without the knowledge of this Commission, and when these particular sheep go to market, they are sometimes infected with scab. We could very easily keep our state clean of scab by quarantining against other states. But the sheep feeding industry of Michigan is one of our great agricultural industries and we do not deem it wise to restrict it and therefore do not expect to remain immune from reinfection. All of the sheep now in quarantine in this state will go to slaughter. The establishments now carrying them will not be permitted to carry sheep for a full season after the infected sheep are shipped out and the environments thereof will become naturally disinfected. * * * * I now state absolutely that no case of scab infection has ever escaped from one of our quarantines and infected other sheep or environments. The growing of all improved breeds of sheep is extensively pursued in Michigan. Our market for this pure bred stuff covers the world, and up to date we have never sent out infected pure bred stock."

The above outline practically indicates the situation that obtains in the sheep industry of the state. Some minor infections such as lip and leg ulceration, scientifically known as necrobacillosis is frequently imported to the state, but is very easily eradicated under our plans of quarantine and treatment.

During the latter portion of 1908 and the winter and spring of 1909 this Commission in cooperation with the federal authorities were given an opportunity in Michigan, under our efficient and forceful law, to establish a world record for any state or country for both time and economy in summarily wiping out an extensive outbreak of foot-and-mouth disease, the tabooed cattle malady of the world.

The success attending this work and the details as to cost of same are treated more extensively in our Twelfth and Thirteenth Biennial Reports.

It is made the duty of the State Live Stock Sanitary Commission to protect the domestic animals of the state from all contagious or infectious diseases of a malignant character. We have reached a point now in writing a history of its work where we may record, without fear of successful contradiction, that the execution of the provision of this law has resulted in wiping from the map of Michigan all contagious diseases of a malignant character affecting domestic animals except two, namely; hog cholera and bovine tuberculosis. It should be understood that Michigan lies across the trail of the live stock of commerce from its breeding grounds in the west, north-west and south-west to the hungry consuming seaports of New York, Boston and Philadelphia together with the fact that we feed hundreds of thousands of western sheep and lambs annually; slaughter and feed in transit thousands and thousands of tick infested cattle of the south-west; and no inconsiderable number of horses enter the traffic in our state carrying all the contagious ills that the equine species is susceptible to. The law we are commenting on, and its execution, has not made this state immune from all or any of the contagious diseases of a malignant character to which domestic animals are susceptible. On the contrary, we import them all annually, monthly, weekly and daily. But we are able by the execution of this law to not only hold in check but absolutely eradicate them, as often as they appear.

As to bovine tuberculosis and hog cholera. We are warranted in emphatically stating as to those two destructive animal diseases that no state in the Union, having so considerable a bovine and swine census as Michigan, has so successfully held those particular diseases under reasonable control.

The following figures and statistics are submitted touching on the subject of bovine tuberculosis and what has been the result of the policy of this Commission in dealing with that insiduous and costly animal disease.

The Legislature of 1909 added Secs. 24 and 25 to our Live Stock Sanitary Laws, which read as follows:

(24) SEC. 24. In case of tuberculous cattle, whenever the commission shall direct the killing of such cattle, it shall be the duty of the commission to appraise the animal or animals condemned, the owner or owners thereof to receive fifty per cent of value of animal as though not diseased, such per cent in no case to be reckoned on a sum over fifty dollars: Provided, That the owner or owners of slaughtered animals shall receive no compensation for the same unless the commission shall be satisfied that the premises have been kept in a sanitary condition. nor shall they receive compensation until said sanitary commission is satisfied that the infected premises have been disinfected in such manner

as to prevent the further spread of the disease. When the state live stock sanitary commission or a member thereof shall deem it expedient to have cattle that have reacted to the tuberculin test, slaughtered under federal inspection, it shall have the power to order such slaughter. If the carcass of any such animal shall pass the federal inspection without being condemned, the owner of the animal shall receive all proceeds secured from the sale of such carcass, after payment for shipping, handling and slaughtering charges have been deducted, in lieu of the above mentioned fifty per cent appraisal value. If the carcass of any such animal shall be condemned by the federal inspectors, the owner of the animal shall receive the proceeds of the sale of the hide, tallow, offal or any other proceeds from the sale of the carcass after deducting the cost of handling, shipping and slaughtering, in addition to the above mentioned fifty per cent appraisal valuation.

(25) Sec. 25. The importation of cattle into the state for breeding or dairy purposes is hereby prohibited, excepting when such cattle are accompanied by a certificate of inspection made by a duly qualified veterinary surgeon, who is a graduate of a recognized veterinary college in the United States, Canada or Europe. Such certificate shall show that at the time of said inspection and within sixty days prior to shipment said cattle had been subjected to tuberculin test and were free from tuberculosis. Duly certified certificates of inspection, giving in full the temperature records of the tuberculin test, must be prepared in triplicate, one of which is furnished the shipper, one furnished the transportation company hauling the cattle, and one forwarded immediately to the president of the state live stock sanitary commission. The expense of such inspection and certificate shall be paid by the owner of the cattle.

Reversing the order and considering Sec. 25 first, it will be noted that this section prohibits the importation of breeding and dairy cattle to this state except when accompanied by a proper certificate as to recent tuberculin testing. Sec. 24 first provides partial remuneration to owners of tuberculous cattle destroyed by direction of the Commission because thus affected, and it also provides means whereby the affected animals may be slaughtered, under federal inspection, leaving the question of expediency of pursuing that method to the State Live Stock Sanitary Commission or a member thereof. It is proper to state that three establishments in Detroit and one establishment in Menominee only in Michigan maintain federal inspection and deal in this class of cattle, and to those establishments only can this Commission direct the shipment of reacting cattle. It had been determined at the commencement of the year 1912 that the zone of "expediency" for shipment to Detroit or Menominee covered practically the entire state. In other words, our experience in connection with these shipments had demonstrated that reacting cattle could be shipped to one of these establishments, maintaining federal inspection, from any point in Michigan to the decided financial advantage of the owner of the cattle, to say nothing about the great advantage to the state, which of course should be made secondary to the interests of the individual. Therefore, the destruction of reacting cattle during the year 1912 has practically been done under federal inspection, excepting in such cases as the owner, for personal reasons, has voluntarily waived his claim against the state.

Thirty-five animals during the year have been, under waiver, thus destroyed. In the period from Sept. 1, 1909 to Dec. 31, 1911, 112 animals had been destroyed under the partial remuneration provision, we are discussing, at a total gross appraisement of $4,995 or a net cost to the state and award to the owners of same of $2,497.50 for the 112 cattle thus destroyed. There have been slaughtered during the year 1912, by direction of this Commission, under federal inspection, 371 cattle, ranging from six months old to aged cattle. Of this considerable drove of cattle thus slaughtered, the carcasses of 311 cattle were passed for human food or more than 80% of the drove, and the carcasses of 60 cattle were condemned. Of these 60 carcasses condemned, 5 belonged to the state through its institutions and, therefore, were not subject to appraisement and 7 others were imported to the state without complying with the statutory requirements in Sec. 25 above referred to, as to the importation to this state of cattle for dairy or breeding purposes, and therefore this Commission was not authorized to appraise same and issue certificates therefor. Through the operation of the same provision of law, however, this Commission was authorized to direct the slaughter, under federal inspection, of 31 more of the same class of cattle as the 7 were and belonging to the same owners, the carcasses of which passed for food and netted to the owners $883.29 or an average of $28.50 per carcass.

Passing further consideration of the 5 cattle belonging to the state and the 7 cattle, which may be termed lawless cattle and condemned, the remaining 48 condemned cattle were appraised by the Commission at $2,095 and certificates of appraisement for $2,095 gross and $1,047.50 net were issued in favor of the owners of the same, and filed with the Governor of the state, being an average net appraisement of twenty-one dollars and eighty-two and one-fourth cents per carcass. It may be stated as a fact, which a thoughtful person would readily anticipate, that the older and larger cattle would as a rule, be more seriously involved with the lesions of tuberculosis and thereby be more likely to be condemned than the young things and by the same token would, if passed, have weighed more and netted more to the owners than did the averages of carcasses passed. But leaving out all that consideration, the figures show that the 311 carcasses passed netted the owners of the same, after all charges were paid $10,196.43 or an average of thirty-two dollars and seventy-eight and one-half cents each or 50% more than they could have received had these animals been destroyed and appraised and the carcasses disposed of upon the premises. As these owners could only have obtained, under state appraisement, less than $22 each, under the operation of the plan of slaughtering under federal inspection, they really did obtain thirty-two dollars and seventy-eight and one-half cents per head. Applying the same rule of appraisement, the state itself saved paying twenty-one dollars and eighty-two and one-fourth cents a head on the 311 cattle passed, being a gross saving to the state treasury of $6,786.80. And as a final justification of this procedure, tons and tons of wholesale meat were conserved for human food.

Since the use of tuberculin to diagnose the presence of tuberculosis in the bovine, Michigan has been using this material. In fact, this state may be regarded as the pioneer in this work. Early in the commencement of its use of tuberculin, it applied the test to more or less cattle belonging to the state. Reactions sometimes occurred and as the institution representatives usually decided to hurriedly dispose of the reactors, the policy was pursued of slaughtering these cattle on the premises, selling the hides and cremating, tanking or burying the carcasses at considerable expense and great inconvenience to the particular institution. That policy was pursued until within the last two years when this Commission decided that it should direct the disposition of these reactors along the lines we are now discussing. Of course a change so radical, met with strenuous opposition by the representatives of the institutions, their principal excuse being that it would give them unpleasant notoriety and unprofitable advertising. Possibly no more striking illustration of the wisdom of the policy we are now discussing can be shown than can be deduced from the figures we are now considering. During the year 1912, 119 cattle belonging to the state, that had reacted to the tuberculin test, have been slaughtered under federal inspection, these cattle ranging in age from six months old calves to mature animals. Of the above mentioned cattle, 114 carcasses passed and 5 carcasses only were condemned. The 114 carcasses passed netted the state $4,668.81 or an average of $40.96 each.

As a final summary, it may be stated that since the partial compensation law became operative September 1, 1909, this Commission has appraised 160 reacting cattle and issued certificates therefor, amounting to $7,090 gross and $3,545 net, or an average of $22.15 per head.

HOG CHOLERA.

Hog cholera is the form of cholera which attacks swine, and is a twin cousin to the disease of the same name which has made such ravages among the human family, which is also becoming better understood and handled by the medical fraternity, and which is lessened and controlled almost entirely by sanitation. This swift and deadly disease is also prevalent among fowls and the word CHOLERA has come to mean consternation in whatever form it appears. The symptoms are so varied, according to conditions, etc., that it frequently puzzles a good veterinarian. This being a germ disease, and carried into the system mainly with the food and drink, affects the whole alimentary canal. The germs being highly infectious renders it easily transmitted, and almost impossible to eradicate without strenuous measures. They will live and multiply in ponds and streams, and will retain their life in the earth for at least three months, even when frozen. Under quarantine conditions, germs are often carried by man, by birds and fowls and by running streams, which shows the difficulty of controlling the disease. Although the conditions for breeding this disease are more favorable during the hot summer and fall months, yet during the past two years complaints have been received during the entire year, and it would seem to be growing into a disease, which so far as seasons are concerned, is becoming general instead of specified.

RAVAGES MINIMIZED.

During the years 1911-12, the disease has been reported to us from nearly every county in the state, and at all seasons of the year; yet at no time has it become epidemic at any point, which is gratifying to us as it inclines us to believe that sanitary conditions are improving, that the hog growers are becoming educated to the proper course to pursue during an outbreak; and also to the fact that we now have a preventative treatment which is almost a certainty—more of which we will speak later on.

MEASURES EMPLOYED.

We group the measures employed under four heads, viz.: RESTRICTION, SANITATION, SEGREGATION, and DISINFECTION. We have found that absolute restrictive measures are necessary and almost invariably the owner is not only willing but anxious to keep his swine entirely within the bounds of any restrictive measures deemed advisable.

The segregation of sick and well animals is an obvious necessity when contending with so infectious a disease as cholera. When the disease is suspected, quickly remove all well ones to a clean, dry place. A herd of swine wallowing in filth and eating insufficient, germ-laden food is a difficult proposition when called upon to eradicate the cholera. Some people seem to think that a hog, being by nature a dirty animal, does not need clean dry quarters and clean food. Because of this very nature of theirs, they need more precaution exercised for their well being than other animals, and are especially susceptible to germ diseases. Especially do they need the most sanitary conditions possible when infection has begun its work.

The disinfectants mostly used are good air slacked lime, carbolic acid solution or some of the commercial disinfectants. We would caution the removal of all rubbish of any kind which could harbor germs; the same to be burned. Then after the yards are clean and free, use the disinfectant with a powerful spray which penetrates every crevice. The quantity must be generous and used at frequent intervals during the presence of the disease.

PREVENTION THE ONLY SAFEGUARD.

It is with much confidence and hope for the future elimination of this dreaded disease that we call attention to the treatment with hog cholera serum as a safeguard. Much time and effort have been given to the perfection of this treatment; and much credit is due Dr. Ward Giltner and the department of bacteriology of the Michigan Agricultural College for their valuable and consistent services in bringing this treament to successful operation among the hog growers of the state. During the last year there has been an increasing number of hog growers who have successfully treated their herds with this remedy and now enjoy the satisfaction of feeling safe from this scourge, and are encouraged to breed more and better animals and fell safety in keeping them immune through this treatment. The veterinarians of the state have quite generally lent their support to this plan of treatment.

The hog cholera serum may be secured at the cost of manufacture from the department of bacteriology at M. A. C. and is regarded by many who have used it as the salvation of the hog industry. The people are gradually being educated to its value and we bespeak a rapid growth in this idea.

TRAFFIC IN HOGS.

Much loss of money and disappointment is annually occasioned by the traffic in hogs where there is no certainty of the herds being immune from cholera. Especially is this so where the hogs are shipped in from another state. This difficulty can be obviated if would-be purchasers would insist upon the stock being treated with hog cholera serum before being purchased. Just recently, three separate complaints have come to this office regarding purchase of stock hogs from the same party. In each case the hogs developed disease very soon after being received; and yet upon investigation no absolute sickness could be detected in the herd complained of, which made an obscure case to deal with.

Great care must be exercised by the purchaser in selecting stock and personally investigating the conditions of the herd from which he purchases. Even then there is danger in the shipment; and an immune hog is the only safe one to buy.

QUARANTINE ON FEEDER HOGS.

The so-called feeder hogs, which are sorted out at the shipping station at Detroit for further feeding by farmers has been the subject of no little trouble and loss in many cases. The farmers are tempted to buy this stock and think it easy to put more weight on at a good profit. They fail to realize the danger of buying from such a heterogeneous collection, which through shipment has taken an added risk of infection.

So much complaint of these cases came to this Commission that we decided upon the strenuous measure of a quarantine upon the Detroit Stock Yards which forbade the sale of any hogs, except for immediate slaughter. This measure was enacted October 18, 1912, and we believe has regulated a matter which was becoming a menace to the hog industry of the state.

H. H. HINDS,
H. H. HALLADAY,
Members State Live Stock Sanitary Commission.

Lansing, Mich., Feb. 25, 1913.

REPORT OF THE STATE VETERINARIAN.

To H. H. Hinds, President State Live Stock Sanitary Commission, Stanton, Mich.:

In May, 1911, I was appointed by Gov. Osborn to the office of State Veterinarian to complete an unexpired term, and on July 1st of the same year I was reappointed for the term of two years ending July 1, 1913. This appointment was made at the request of the representatives of the State Board of Agriculture with the idea that it would be for the mutual interests of the College and Experiment Station on the one hand and of the State Live Stock Sanitary Commission and live stock interests of the state on the other. We trust that no one has been disappointed more than the recipient of the honor of the appointment.

The pleasantest of relations have existed in the pursuit of all the duties of the office, but it is well to call attention to the serious interference with real research and satisfactory teaching that has resulted from enforced absence from the laboratory. Most of the work reported here is of a routine nature that it is felt could be performed by another, under suitable direction, with the result that our time could be more profitably devoted to instruction and research, the demand for which is apparent.

Correspondence connected with this work has been a great consumer of time, but it may well be classed as valuable extension work. It is significant that much of this correspondence is impersonal, i. e., letters come to the State Capitol and to the Agricultural College for the State Veterinarian from residents of the state who seem to expect naturally that the State Veterinarian is to be reached in this manner, although they are not informed as to who is the official. This indicates that the office of State Veterinarian should be located at the Michigan Agricultural College. After my appointment, the members of the Live Stock Sanitary Commission were notified that it was my intention to attend the University of Chicago for the summer, consequently I was not called upon until August, 1911.

August 5.—Made autopsy on 7 reacting cattle near Zeeland, 5 of which showed supramammary glands affected. No involvement of mammary gland. The animals should have been used for beef.

August 9.—Visited Perronville and Whitney where 2 herds of cattle were recovering from foot-rot. Cause seemed to be local. No. B. necrophorus could be isolated.

August 11.—At Ashley, found very extensive losses in sheep due to stomach worms (H. contortus). Attending veterinarians and farmers at a loss to account for deaths. Dense ignorance of commonest sheep disease manifested.

August 15.—At Mulliken, found Red Poll cow suffering from malignant catarrh. Similar cases reported in previous annual report of bacteriologist.

August 21.—At Lowell, killed 4 fat Red Poll cattle. All showed slight lesions of tuberculosis and would have passed federal meat inspection. Should have been used for beef.

August 30.—A horse near Kalamazoo examined for glanders.

September 2.—Tested 9 cows near Zeeland on farm of J—— K———. Five reacted. Stables and watering facilities in most unhygienic condition.

September 5.—Near Adrian, drew 4 samples of blood from horses reported on account of suspicion of glanders. Serum tests resulted negatively. An examination of a portion of lung tissue said to have come from a glandered horse on this farm resulted in revealing emphysema only.

At Onsted, found a severe outbreak of hog cholera. Serum treatment was used on neighboring farm.

September 6.—Drew blood from horse near Kalamazoo noted under August 30. Serum tests resulted negatively.

September 7.—Killed a heifer at Bath. Actinomycosis of the tongue.

September 11.—A cow at Hope suspicious of being tuberculous was slaughtered at owner's request. The cow was in excellent physical condition. All the subcutaneous lymph nodes were greatly enlarged, showing very prominently, especially the parotid, submaxillary, prescapular, precrural and supramammary. Internally, the same condition was found. The lymphatics of the sublumbar region approached the size of the animal's liver. The wall of the uterus (pregnant) was greatly thickened with lymphatic tissue. It was reported that similar cases had occurred in the neighborhood. We had recently seen a case on a farm near the college. Diagnosis: Hodgekin's disease.

September 25.—Tested 8 cows at Atlas. No reactions.

October 6.—Examined horse at Cambridge. Horse very weak in hind quarters. Temp. 103°. Eating fairly well. Coat thin and soft. Mucosae pale, slightly yellowish. Slight oedema of sheath and interaxillae and stocking of legs. Heart enlarged and impact of beat felt over entire thorax. Respirations labored at least exertion. Action of bowels and kidneys appeared normal. Jugular blood very thin, coagulated slowly. Erythrocytes formed about one-fifth of volume at bottom of bottle, buffy coat contained particles like disintegrated erythrocytes.

On October 11, horse was unable to stand. Temp. 98°. No appetite since October 6. Blood from jugular showed fewer erythrocytes and less coagulability. Little edema. Appeared weak as from hemorrhage.

Autopsy: Brain pale, meninges slightly oedematous, slight ecchymoses in subcutem, oedema variable, lymph nodes generally oedematous and hemorrhagic, thymus very hemorrhagic (larger than normal), lungs considerably oedematous and emphysematous with rupture of air sacs, also ecchymoses on visceral pleura of cephalic lobes. The chambers of the heart are greatly dilated but the walls are not hypertrophic, slight sub-epicardial hemorrhage and epicarditis of left side, pericardial sac contains about one liter of amber-colored fluid; liver is enlarged and engorged with blood; pancreas normal; spleen greatly enlarged with tense capsule and pulp like blackberry jam, splenic lymph nodes hemorrhagic, enlarged and oedematous, gastro-intestinal tube nearly empty, kidneys greatly enlarged and oedematous, bladder distended with pale urine. Diagnosis: Infectious anaemia.

This horse had been sick since June, 1911. The owner had lost two cases previously.

October 26.—Injected 9 cc. of blood serum from above described case into jugular vein of horse belonging to the veterinary department. Temperatures were taken twice daily until November 7. On November 2, the highest temperature was recorded as 101°. No effects of the injection could be seen. The horse was killed January 4, 1912, and it was reported that the blood was notably pale and watery.

October 13.—Tested 3 cows at the Altenheim, Monroe. One reacted. Of the other two, one coughed and the other was greatly emaciated.

October 15.—Tested a herd of 14 cattle at Flat Rock, nearly all reacted. (Records of test kept by commission.)

October 18.—Examined flock of sheep at Bellevue for sore mouth and foot-rot. Not serious. Healing spontaneously.

October 20.—Tested 5 cows at Borculo for Mr. B————. Three reacted.

October 27.—Tested 60 cattle for Wayne County Farm at Eloise. Bull only reacted. Bull came from a notoriously affected herd.

October 30.—Autopsied cow at Imlay city. Impaction of omasum with secondary disturbances. Probably corresponds to Grand Traverse disease.

November 4.—Tested herd of Mr. G————, Zeeland. One reactor. Owner reported that one non-reactor, that was suspicious, gave a severe constitutional reaction 36 hours after the injection.

November 10. Autopsied reactor at Zeeland on farm of Mr. G——— and at Borculo on farm of Mr. B———. These cattle should have been used for beef with one exception.

November 14.—Investigated outbreaks of hog cholera at Hartford. Local stock yards must have been badly infected.

November 25. Autopsied cattle on farm of Mr. J—— K———— at Zeeland, tested September 2. Stables still unsanitary. Cattle should have been used for beef.

December 4.—Attended meeting of U. S. L. S. S. Association at Chicago, representing Michigan.

December 14.—Found outbreak of bloody dysentery in dairy cattle at Whittaker. Probably due to filthy water from well in pig pen. Dairy and Food Commission caused alterations to be made.

December 30.—Investigated cause of deaths in sheep at Romeo. Sheep had suffered from stomach worms in fall, gone into winter quarters in bad shape and were very badly infested with sheep ticks. They were sheared and improvement followed.

January 8, 1912.—A suspected case of glanders at Shelbyville was found to be an old horse suffering from a diseased molar.

January 31.—Tested 4 herds near Overisel. Two gave no reactions, in one 100 per cent reacted, and in the other only one steer calf failed to react. These animals were supplying milk to the Overisel Creamery. Skim milk from this creamery is returned unsterilized to the community at large. The reacting cattle were shipped to Detroit and slaughtered under federal inspection.

February 10.—An investigation was made at Flint of a disease of pigs. A certain bunch of pigs was dying on this farm although hog cholera serum had been used on the entire herd. The pigs that died showed a purulent broncho-pneumonia and pericarditis. They had been introduced onto this place during extremely cold weather and acute congestion of the lungs was undoubtedly present at the time of treatment. This trouble persisted perhaps on account of the development of a germ of unusual pathogenicity.

March 5.—Tested over 90 cattle at Traverse City asylum. Large number reacted. Reactors shipped to Detroit and killed under federal inspection.

March 13.—Found hog cholera at Freesoil. Origin not determinable.

March 14.—Retested herd of 11 cattle at Comstock Park. These cattle were all tuberculous as determined at autopsy. Four failed to react typically.

March 21.—Tested herd at Litchfield. One reacted. Quarantined.

April 1.—Tested 60 cattle at Ionia Asylum for Criminal Insane. No reactors.

April 4.—Tested 40 cattle near Grand Rapids on farm of Mr. McN—. Three reacted.

April 10.—Found stomach worms in sheep at Turner.

April 11.—Investigated outbreak of influenza in horses at Saginaw. Horses had been shipped in from Chicago and a number had died. Disease did not spread seriously.

April 13.—Tested horse of Mr. J—— G————, Portland, with mallein. Typical reaction. This horse had already reacted to agglutination and complement fixation tests. The animal was slaughtered at the bacteriological laboratory and glanders nodules were found in the lungs, liver and spleen. The nasal septum and maxillary sinuses were affected unilaterally. Thirteen samples of blood were drawn from horses and mules. No reactions.

April 18.—Tested 4 herds near Overisel. In the first herd 2 reactions, in second 1 reaction, in third 1 reaction, and over 60 per cent in last herd. All reactors shipped to Detroit, and slaughtered under federal inspection.

April 25. Tested herd near Adrian. No reactions.

April 27.—Tested large herd at Palmyra. Two reactions.

May 9.—Tested herd at Bay City. About 60 per cent reacted.

May 17.—Found cattle dying on farm near Grand Blanc. Autopsy on one calf showed intestinal hemorrhage in caecum and colon near ileo-caecal valve. No cause could be found.

May 23.—Rabies at Byron. Three cattle bitten. One only died.

May 24.—Inspected herd near Lansing reported by Dairy and Food Department. Later, test made by Mr. Himmelberger. Showed no reactions.

May 27.—Found 5 farms near Durand on which hog cholera had been raging. Serum was not used. Too late.

May 28.—At Lowell, found stomach worms (H. contortus) in calves. Five had died. First time seen by us in Michigan in calves. Pasture was low and wet.

May 31.—Tested herd at state institution at Lapeer. One reaction.

June 1.—Killed cow tested for Altenheim, October 13, 1911. No lesions were found.

June 4.—Treated by simultaneous method show herd of Berkshires at Bennington. This was an effort to establish a plan for treatment of show stock in order to insure protection throughout the fall fair circuit.

June 5.—Tested herd of Mr. J—— L———— near Zeeland, one reacting.

June 7.—Cow reported as suspicious of tuberculosis at Decatur. Nothing especially suspicious found.

June 8.—Found at Vandalia herd of 90 sheep, western and native, badly affected with scab. Stomach worms also present.

June 14.—At Bellaire cattle had died, probably on account of so-called Grand Traverse disease.

June 18.—Two cattle were autopsied near Flint. One other had died. Symptoms were such as to suggest rabies. Autopsy showed subepicardial, endocardial and pericardial hemorrhages and acute nephritis. No Negri bodies found in cornu ammonis. Diagnosis not made.

June 21.—Tested herd of Mr. J—— H——— near Overisel. Eight tested, of which 5 reacted.

July 5.—Investigated outbreaks of rabies at Garden, Delta Co. Records were found of at least thirty horses, cattle and dogs that had been bitten, developed symptoms of rabies and died. It is possible that wolves were involved in the spread of this outbreak. A positive diagnosis was made by material shipped to the laboratory by express. Negri bodies were found in the brain of a heifer. Prompt and vigorous action was taken by the local board of health to prevent the further spread of the disease.

July 26.—Investigated calf disease at Lapeer School for Feeble-minded. Trouble proved to be goiter and did not persist.

August 14.—Made retest on three heards at Saginaw. Original test made by student tester and local veterinarian. Only small percentage of original reactors reacted at this test.

August 19.—Investigated hog disease at Fennville, Mich. No indications of hog cholera. Probably due to over-crowding and dietary trouble.

Aug. 22.—Investigated reported case of glanders at Bellevue. Proved to be diseased tooth. Serum test negative.

Sept. 8.—Investigated reported case of glanders at Romeo. Physical examination did not reveal typical clinical symptoms of glanders. Serum tests on a number of horses in the stable resulted negatively.

Sept. 25.—Tested herd of Holsteins at East Lansing. A number of reactors found. Some of the cows were excreting tubercle bacilli in the milk as proven by laboratory tests.

Dec. 2-4.—Attended conference of hog-cholera serum workers called together by the Chief of the Bureau of Animal Industry; also attended the annual meeting of the U. S. Live Stock Sanitary Association. Both meetings held at Chicago. On return trip, I addressed the meeting of the West Michigan Holstein Breeders Association on the subjects of tuberculosis and infectious abortion.

About the first of October, 1912, my active relationship to the work was altered by the departure of Dr. C. E. Marshall, the director of the Bacteriological Laboratory at M. A. C. for Amherst, Mass., to assume the duties of Dean of the Graduate School of Agriculture. I had been working with Dr. Marshall for over four years and it was decided by the Board of Agriculture to place me in charge of the laboratory. We have been fortunate in securing the services of Dr. E. T. Hallman, who comes from Auburn, Ala., where he has been engaged in teaching and investigating along the lines of Bacteriology and Pathology. An account of his work follows:

WORK FOR THE LIVE STOCK SANITARY COMMISSION.

October 26.—Found calves dying of verminous broncho-pneumonia (Strongylus micrurus) at West branch.

Oct. 31.—Found hog cholera on farm of Mr. E——— S——— near Bancroft.

Nov. 1.—Investigated reported case of suspected glanders at Harrisville. Serum tests negative.

Nov. 3.—Investigated case of white scours of calves on farm near Jackson.

Nov. 8.—Found hog cholera at Litchfield.

Nov. 9.—Investigated reported case of suspected glanders near Lennon. Found animal dead and had been buried four days.

Dec. 2.—Investigated a disease of pigs on farm of Mr. H——— near Clinton. Held three autopsies and found each had died with an acute fibrinous gastro-enteritis. Could not ascertain cause.

Dec. 5.—Attended meeting of West Michigan Holstein Breeders Association at Grand Rapids to give talk on the tuberculin test.

Dec. 20.—Investigated disease of horses near St. Johns. Diagnosis not made but later diagnosed as influenza. Source of infection probably from band of horse traders that had camped near pasture of this farm.

Jan. 6.—Investigated disease of lambs on farm near Grand Blanc. Owner had lost 35 or 40 within a few days out of a flock of 350. Several sick at time of visit, some of which presented symptoms of "gid." Autopsies on three animals failed to demonstrate the causative agent of "gid" (Coenurus cerebralis) but the twisted wire worm (Haemonchus contortus) was found in the abomasum of each lamb autopsied.

Jan. 10.—Found hog cholera on farm near DeWitt. Another farm about one mile distant, the owner of which I saw, had a history of cholera.

Jan. 21.—Investigated a disease of horses reported by the supervisor of Monroe township, Newaygo county. One farmer had lost four horses, all that were kept on the farm, within 6 or 7 weeks' time. A farmer on an adjoining farm had lost one head one other that had been affected but had fully recovered at the time of visit. Diagnosis not made.

Jan. 30.—Visited farm near Sunfield to investigate a reported case of forage poisoning. Farmer owning three horses had lost two and the third one was sick. Temp. 98, pulse 60 per min., weak, but regular. Conjunctiva and mucosa of nasal passage injected. Very slight seropurulent nasal discharge. Bowels constipated. The horse was down and showed no pain, was in a slight comatose condition but at times would manifest some restlessness. The owner informed me that each horse had shown some difficulty in swallowing at the first of the attack.

These horses had been fed on silage, corn fodder and corn. The silage was moldy.

Feb. 3.—I again visited above mentioned farm near Sunfield to hold an autopsy on horse mentioned above. Lesions: Few hemorrhagic areas in mucosa of fundus of stomach varying in size from 1 to 2 cm. Liver of normal consistency but bile stained. Spleen presented a few localized engorged areas. Maxillary sinuses each contain about one-half pint of sero-purulent effusion. Mucosa of sinuses injected and in places show grayish deposit of coagulated exudate. Mocosa of trachea and bronchi injected. No effusion into cranial cavity nor into ventricles of brain. Meninges and brain apparently normal. Bacteriological examination of effusion into sinuses and histological examination of brain not completed.

E. T. HALLMAN.

In addition to the work reported above, the Laboratory of Bacteriology of the Michigan Agricultural College has done all the laboratory work for the Live Stock Sanitary Commission. This includes the examination of pathological specimens sent in from all parts of the state, post-mortem examinations of animals sent in alive or dead, and the preparation of samples of blood for serum tests. This work has been done at the expense of the College.

We have also engaged in the production of hog cholera serum, and supplied tuberculin and mallein free of charge to veterinarians for official testing. A great many tuberculin tests have been made by agricultural students trained in this department and with the coöperation of the Commission a large number of tuberculous animals have been disposed of in this manner.

Respectfully submitted,
WARD GILTNER.

JANUARY 1ST, 1915.

FIFTEENTH BIENNIAL REPORT

OF THE

STATE LIVE STOCK SANITARY COMMISSION

OF MICHIGAN

FOR THE

YEARS 1913 AND 1914.

A. D. MDCCCXXXV.

BY AUTHORITY

LANSING, MICHIGAN
WYNKOOP HALLENBECK CRAWFORD CO., STATE PRINTERS
1915

STATE LIVE STOCK SANITARY COMMISSION OF MICHIGAN.

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PATHOLOGIST.

E. T. HALLMAN, D. V. M.	EAST LANSING

Live Stock Sanitary Commission and State Veterinarian's Office in Rooms 602 and 604 Prudden Block, Lansing, Mich.

REPORT OF THE MICHIGAN LIVE STOCK SANITARY COMMISSION.

FOR THE BIENNIAL PERIOD OF 1913 AND 1914.

To the Hon. Woodbridge N. Ferris, Governor of Michigan:

The Michigan Live Stock Sanitary Laws, enacted by the State Legislature in 1885, provided for the appointment of a Live Stock Sanitary Commission, consisting of three members, who were to have general supervision of the health of the domestic animals of the state. The duties of the Live Stock Sanitary Commission were defined in Act 182, P. A. 1885, and this act has been amended from time to time by various sessions of the Michigan State Legislature as succeeding years have resulted in the increased development of the Live Stock interests of the State, and new and changing conditions have necessitated changes in the Live Stock Sanitary Laws.

The live stock interests of Michigan have been developing rapidly in recent years, and the increasing prices received for horses and dairy cattle, together with the prevailing high prices of all other cattle, sheep and swine raised or fed for market have made dairying and the breeding and feeding of domestic animals one of the greatest agricultural pursuits in Michigan today. Representing, as it does, an investment of millions of dollars, the necessity of protecting the domestic animals of the state against the ravages of contagious and infectious diseases becomes more apparent each year, for the control of these live stock diseases is a direct benefit not only to the live stock owners but to the consumers of meats and dairy products as well.

It might be well in this report to call attention to some of the outbreaks of contagious and infectious diseases among the domestic animals in this State in the past, lest we forget the service rendered to the live stock interests of Michigan by the men who have preceded us as members of this Commission.

It is a matter of record that in the years of 1885 and 1886, some 200 cows valued at over $10,000, and belonging mostly to poor people residing in Detroit and vicinity, died from the ravages of the destructive southern tick, brought into the State by the so-called Texas cattle. This live stock pest was eradicated from the State in 1886, through the efforts of the Live Stock Sanitary Commission, aided by wise legislative enactments.

The records of this department show that there was a serious outbreak of glanders in the State prior to the year 1890, and that horses affected with the highly contagious and infectious disease known as glanders were destroyed in Allegan, Alcona, Antrim, Bay, Branch, Cass, Calhoun, Crawford, Chippewa, Clinton, Delta, Genesee, Gogebec, Hillsdale, Huron, Ionia, Ingham, Jackson, Kalkaska, Lenawee, Macomb, Mason, Mecosta, Menominee, Midland, Montcalm, Monroe, Muskegon, Oakland, Oceana, Otsego, Sanilac, St. Clair, Tuscola, Van Buren, Wayne, Washtenaw and Wexford counties, as a result of the activities of this Commission in the counties enumerated above. Glanders was nearly eradicated from Michigan, and for nearly twenty years, a case of glanders in the State was seldom found. During the past two years, some twenty horses have been found affected with glanders, and as a large percentage of these horses were branded horses shipped into Michigan from western states, the need of a law prohibiting the shipment of horses into the State, unless they have been tested for glanders by a competent veterinarian, is clearly shown and we respectfully request the present session of the Michigan State Legislature to enact such a law.

The "Foot and Mouth disease" outbreak near Detroit in the year 1908 was soon placed under control and the disease eradicated from the State through the efforts of the members of the Live Stock Sanitary Commission, acting in co-operation with representatives of the Bureau of Animal Industry.

There were no further outbreaks of this dreaded disease in Michigan until the present year, when a very serious outbreak occurred in Berrien and Allegan counties, with scattered cases in Branch, Hillsdale, Lenawee, Monroe, Jackson, Wayne, Eaton, Genesee, Lapeer, Macomb, Montcalm, Saginaw and Tuscola counties. The outbreak in Michigan started in southern Berrien county where a large number of herds became infected, and had to be slaughtered. The infection in nearly all the other counties in the state originated in shipments of cattle from the infected Chicago sock yards, and the further spread of this disease from this source was only stopped by a rigid quarantine being placed by this Department against the Chicago stock yards, with the approval of Governor Ferris.

There have been two thousand nine hundred and thirty-nine cattle, three thousand nine hundred and ninety-three swine, and eight hundred and fifty-two sheep slaughtered in Michigan to date, which had either become infected with, or were exposed to "Foot and Mouth Disease." Two hundred and thirty-six herds have been slaughtered at an appraised value of two hundred and nine thousand one hundred ninety-nine dollars and twenty-four cents ($209,199.24).

The most of these herds were appraised by Hon. L. Whitney Watkins, who has rendered this Department and the live stock interests of the State valuable service in our fight for the control and eradication of "Foot and Mouth Disease" from Michigan.

The Commission has at all times acted in co-operation with the representatives of the U. S. Bureau of Animal Industry.

The U. S. Department of Agriculture will pay one-half of the appraised value of the animals slaughtered, and the State of Michigan will pay the remaining half. The expense of burial of the animals, and the cost of disinfecting the infected premises will be equally divided between the U. S. Government and the State of Michigan. This expense can only be estimated at the present time, as many of the bills have not yet been received. A complete report of the nature of "Foot and Mouth

Disease" will be found in the report of the State Veterinarian in succeeding paragraphs.

The breeding of pure bred cattle, especially the dairy breeds, has become an important live stock industry in Michigan during recent years, and the pure bred live stock breeders have exercised considerable care in keeping their herds free from tuberculosis and contagious abortion.

The Legislature was asked to pass a law for the protection of Michigan herds against the bringing of diesased cattle into the State by unscrupulous cattle dealers with the result that Section 25 of the Michigan Live Stock Sanitary Laws was enacted, which reads as follows:

"(25) Sec. 25. The importation of cattle into the State for breeding or dairy purposes is hereby prohibited, excepting when such cattle are accompanied by a certificate of inspection made by a duly qualified veterinary surgeon, who is a graduate of recognized veterinary college in the United States, Canada or Europe. Such certificate shall show that at the time of said inspection and within sixty days prior to shipment said cattle had been subjected to tuberculin test and were free from tuberculosis. Duly certified certificates of inspection, giving in full the temperature records of the tuberculin test, must be prepared in triplicate, one of which is furnished the shipper, one furnished the transportation company hauling the cattle, and one forwarded immediately to the president of the State Live Stock Sanitary Commission. The expense of such inspection and certificate shall be paid by the owner of the cattle."

The present Live Stock Sanitary Commission has made an effort to enforce this section of the law, and a number of car loads of cattle originating in other states have been held up when not tuberculin tested as provided by law, and have been ordered sent out of Michigan when shipped in by cattle dealers and speculators.

In numerous other instances, where cattle have been shipped into the State by residents of Michigan not familiar with the law, the cattle have been placed in quarantine until they have been carefully tuberculin tested at the owner's expense and found to be free from tubrculosis.

As a result of these precautionary measures, it is generally conceded that Michigan cattle are comparatively free from tuberculosis and contagious abortion.

This fact will prove of untold benefit to the pure bred cattle breeders and dairy interests of the State when this fact becomes more generally known to prospective purchasers of pure bred and dairy cattle from other states, who are looking for sound healthy cattle with which to establish profitable herds.

The last session of the Michigan State Legislature amended Section 24 of the Live Stock Sanitary Laws to read as follows:

"(24) Sec. 24. In case of tuberculosis cattle, whenever the commission shall direct the killing of such cattle, it shall be the duty of the commission to appraise the animal or animals condemned, the owner or owners thereof to receive fifty per cent of value of animals as though not diseased, but such sum shall in no case exceed the sum of fifty dollars: Provided, That the owner or owners of slaughtered animals shall receive no compensation for the same unless the Commission shall be satisfied that the premises have been kept in a sanitary condition, nor shall they receive compensation until said Sanitary Commission is satisfied that the infected premises have been disinfected in such manner as to prevent the further spread of the disease. When the State Live Stock Sanitary Commission, or a member thereof, shall deem it expedient to have cattle that have reacted to the tuberculin test slaughtered under federal inspection. or under the inspection of a competent veterinarian authorized by the State Live Stock Sanitary Commission, it shall have the power to order such slaughter. If the carcass of any such animal shall pass the inspection without being condemned, the owner of the animal shall receive all proceeds secured from the sale of such carcass after payment for shipping, handling and slaughtering charges have been deducted, in addition to the above mentioned fifty per cent appraisal value. If the carcass of any such animal shall be condemned by the inspectors, the owner of the animal shall receive the proceeds of the sale of the hide, tallow, offal or any other proceeds from the sale of the carcass, after deducting the cost of handling, shipping and slaughtering, in addition to the above mentioned fifty per cent appraisal valuation: Provided, That any animal, upon being slaughtered, and showing no tuberculin lesions, the owner thereof shall be paid full value for such animal, but such sum in no case shall exceed the sum of seventy-five dollars. The State Live Stock Sanitary Commission shall have power to designate the places where suspected animals shall be slaughtered, and also to employ a competent inspector to examine the carcasses of slaughtered animals."

This additional remuneration for tubercular cattle slaughtered has proved an incentive for owners of cattle to test their herds and remove the tubercular animals, and thus materially reduce the number of tubercular cattle in the State.

This Department estimates that about 700 herds of cattle have been tuberculin tested in Michigan during 1913 and 1914.

The files in our office show that nearly 8,000 head of cattle have been tested and 647 reacting cattle have been slaughtered and remuneration to the amount of $20,512.00 has been paid by the State of Michigan to the owners of these reacting cattle during the biennial period of 1913 and 1914.

The number of tubercular cattle slaughtered with the remuneration paid for the same is hereby tabulated by counties, showing the number of tubercular cattle slaughtered in each county, with the total amount received from the State in each county by the owners of these cattle:

Counties.	Number.	Appraisal.	Paid by State.
Kent	143	$8,949 00	$4,474 50
Oakland	74	5,930 00	2,965 00
Allegan	61	3,385 00	1,692 50
Ottawa	57	2,928 00	1,464 00
Bay	39	3,700 00	1,850 00
Ingham	19	1,700 00	850 00
Macomb	27	1,322 00	661 00
Newaygo and Muskegon	33	1,740 00	870 00
Kalamazoo	28	1,530 00	765 00
Berrien	20	1,190 00	595 00
Livingston	6	450 00	225 00
Saginaw	3	200 00	100 00
Lenawee	8	500 00	250 00
Wexford	2	150 00	75 00
Wayne	19	925 00	462 50
Barry	12	750 00	375 00
Ionia	9	550 00	275 00
Calhoun	8	750 00	375 00
Washtenaw	12	630 00	315 00
Genesee	8	610 00	305 00
Menominee	15	600 00	300 00
Oceana	7	575 00	287 50
Branch	6	330 00	165 00
Alger	5	250 00	125 00
Clinton	4	250 00	125 00
Monroe	2	200 00	100 00
St. Clair	4	200 00	100 00
Emmett	4	170 00	85 00
Jackson	2	100 00	50 00
Van Buren	2	100 00	50 00
Chippewa	2	85 00	42 50
Hillsdale	1	50 00	25 00
Arenac	1	50 00	25 00
Missaukee	1	50 00	25 00
Schoolcraft	1	50 00	25 00
Montcalm	1	50 00	25 00
Gratiot	1	25 00	12 50
Grand total	647	$41,024 00	$20,512 00

The above tabulated report showing 647 reacting cattle slaughtered out of about 8,000 head of tuberculin tested must not be taken as showing the probable percentage of tubercular cattle in Michigan.

It must be remembered that during the biennial period of 1913 and 1914, the Live Stock Sanitary Commission has ordered numerous suspicious herds tuberculin tested with the result that a number of these herds have been found to be from 25% to 100% tubercular, and these diseased cattle have been slaughtered and are included in the 647 tubercular cattle listed above.

It is the opinion of this Department that the percentage of tubercular cattle in Michigan is comparatively small at the present time, and it is hoped that pure bred cattle breeders and dairymen will continue to exercise all necessary precaution in the future as they have in the past and thus continue to keep their herds free from tuberculosis.

This Department desires to respectfully call the attention of the Michigan State Legislature to Section 27 of the Michigan Live Stock Sanitary Laws, which reads as follows, viz.:

"(27) Sec. 27. It shall be required of all individuals or firms who sell mallein or tuberculin to any resident of the State of Michigan to report such sale immediately to the State Veterinarian, including the date of sale, name and address of parties to whom sold, and the amount of such sale."

There is no penalty provided for the violation of this section of the law, and during the biennial period of 1913 and 1914 not a single case of the sale of mallein or tuberculin by individuals or firms has been reported to the State Veterinarian. We would recommend that this section of the law be amended to prohibit any firm of individual selling mallein or tuberculin to any resident of the State of Michigan, except where permission is given by the State Live Stock Sanitary Commission, or a member thereof, or by the Michigan State Veterinarian, and where this law is violated, a suitable penalty should be provided.

We believe that this Department can give better protection to the live stock interests of the State if we have a record of where and when mallein and tuberculin is used.

SHEEP.

Since our last report, very few cases of disease in sheep have been reported to this office. The disease commonly known as "scab" has become almost extinct in Michigan. Since our last report, but four cases of this disease have been known to exist in the State. These cases have yielded readily to treatment by a thorough dipping with a solution of nicotine or coal tar preparations. It was at one time thought that scab could not be cured, but it has been demonstrated that it can be cured and it is easily handled, and at the present time, I believe we are safe in saying that not a single case of scab exists among the flocks of this State.

HOG CHOLERA.

The hog cholera situation, while not unusually alarming, is nevertheless a very serious problem; and in the past has baffled all attempts at eradication or control. It is today the most infectious, contagious disease which attacks the hog family, and makes very uncertain the success of pork production by the farmers. The ravages of this disease are not greater at this time than they have been, and no greater in Michigan than in many states. Still the problem is unsolved and the proposition of best handling the disease is very important. This work is one of our Department's activities and we hope to make it very prominent and efficient in the future.

TERRITORY.

The disease is found in all parts of the world in varying degrees of prevalence. In the United States it was first recorded in Ohio in 1833 and was supposed to have been introduced by foreign importation of hogs, and has spread to every section of the United States. Federal investigators have estimated the loss to hog raisers of the country to be at least $60,000,000.00 per year.

NATURE AND DESCRIPTION.

Cholera is not borne in the air, as many suppose, but is acquired by taking the germs into the system, mainly with the food and drink of the animal, and it affects the whole alimentary canal, which explains the necessity for clean and careful feeding and quartering of hogs. This germ is an ultra-microscopic, living thing, the nature of which is not understood at the present time, even by competent pathologists. As science advances, we expect to understand this baffling subject and acquire a positive, practical cure, but until we do, we must work upon preventive methods. The germ, or micro-organism is present in the blood or excretions of the sick hog, particularly the feces and urine which explains the highly infectious nature of the disease; and as it is taken into the body through the food, and drink of the animal, it can readily be seen that manure and other filth from the pens must be kept from the food of the herd. This fact also explains the necessity for radical sanitary treatment and strict quarantine. The majority of hog pens are in a filthy condition as the result of the accumulation of litter and manure gathered through months and perhaps years. Many times food is scattered in the pens and becomes contaminated by all kinds of filth before being eaten by the hog. Hence, if cholera has existed, the litter and manure has been saturated with the body discharges of sick animals and is alive with the germs. The building of pens enclosed with fine wire netting and provided with cement floors to which the hogs are admitted only at feeding time is evidently a wise precaution, these feeding pens to be thoroughly disinfected and cleaned regularly. A strong healthy hog cared for in a sanitary way is less susceptible than one which has been neglected in the way of feeding or care. A herd of swine wallowing in filth and eating insufficient and germ laden food offers very favorable conditions for the ravages of this disease. One peculiarity is, however, that fat hogs seem more susceptible than those in ordinary feeding or growing condition. In either case, the vitality has been reduced. An unsanitary condition may lower the vitality of hogs and increase the danger of recurrence of the disease, but cholera can be started in a herd only by the introduction of the germ which causes it, and we wish to emphasize the fact that cholera is seriously infectious, and any one claiming to the contrary must be given no credence, as all medical and scientific men agree as to this fact.

SYMPTOMS.

The symptoms of this disease are so varying that no reliable guide can be offered to detect its presence, also, there are two forms, acute and chronic, which present different outward evidences; so that the disease often gains a strong foothold in any community before its presence is determined. At the beginning, of an outbreak in a herd usually, but one or two animals seem sick and no particular characteristic seems evident. Later, other animals become sick and then the amount and virulence of the infection increases. The symptoms most evident during an epidemic of hog cholera are as follows:

1. Failure to come up for food or refusal to eat.
2. Lying together in pens or nest.
3. Vomiting.
4. Coughing.
5. Stiffness, indicated by staggering about.
6. Discharge from eyes or sticking together of eyelids.
7. Redness of skin, noticeable on white hogs.
8. Rise in temperature.
9. Constipation, alternated by profuse diarrhea.

A careful examination, made even by an experienced veterinarian, will not always disclose sufficient evidence of the disease, and the diagnosis is not trustworthy without a postmortem examination to determine internal lesions.

The diseases which are most often taken for hog cholera are: Anthrax, worms, and digestive troubles. However, if any considerable number of hogs die on a farm or in a community from a contagious or infectious disease, it is safe to suggest hog cholera as the disease causing the loss. If a careful diagnosis is made early, serious loss may be prevented by segregation of well ones to clean quarters and controlling the spread of infection.

SPREADING.

The infective agent of hog cholera is just as virulent and dangerous to hogs as is the smallpox virus to people. The manure of a sick hog is perhaps largely responsible for the rapid spread of the disease, since the excretion contaminates the food supply unless extreme care is used. The feces or infected manure retain their virulence from 65 to 95 days and requires most vigorous disinfecting and renovating to be destroyed. The cholera infected hog which has died and been left unburied is a great danger in a neighborhood. Various animals, such as dogs, cats, rabbits, buzzards, and pigeons are carriers of the disease. The germs may be carried on the shoes and clothing of any one handling the hogs, and thus carried to healthy herds. All curious visitors and neighborly calls should be kept outside of the infected yards. Vehicles or tools used around the disease need a thorough disinfection as do the people and clothes which come in contact with the hogs. Running streams are carriers of the disease, and they often carry infection down stream where there are outbreaks above. The old time hog-wallow is certainly a gatherer of disease germs.

People sometimes think anything is good enough for the hog, simply because he is a hog. Let us give him pure drinking water and a healthy bathing place and keep him decently surrounded by sanitary conditions. The simple, clean, feeding pens mentioned above combined with sanitary surroundings will do much to lessen the spread of infection. The practice of using public stock yards and scales for handling infected herds is a serious offense against the law. Whenever cholera hogs are to be handled or treated, it should be done under quarantine regulations. Freezing weather usually tends to check the progress of cholera, but does not eradicate it; and it lingers through cold weather to appear again as soon as favorable conditions prevail. A hot, dry, prolonged summer usually will do more to disinfect premises than any other natural agency.

CURES.

We must bear in mind the emphatic statement that as yet there is no known cure for the disease and no treatment that is effective in all cases. Do not be mislead by the quack medicine vender, or the person who is exploiting some wonderful curative treatment. The only lines we have to work upon are preventive methods and serum treatment for immunizing the animals; and these treatments are meeting with but varying degrees of success. Sick hogs should be treated by a competent veterinarian just as skilled physicians are employed for the human family. Ignorant and untrained men going about the country advertising their wares are not competent to diagnose cases, or post animals, and should be refused permission to experiment with the disease and thus scatter the infection.

The serum treatment for immunizing hogs has, when properly administered, proved trustworthy in a great many cases, and also been the cause of disappointment and loss in other cases. Much depends upon the skill and experience of the one who does the work and also the sanitary conditions and watchful care given the herd, but even when these details are carefully watched, the potency of the serum is an important matter. The making and placing upon the market of serums and viruses form a wide field for unscrupulous dealers, and needs careful watching, as loss and trouble result from using impure or valueless serum. This point emphasizes the fact that our legislature should provide sufficient funds to allow the State to produce and send out pure and potent serum to all farmers within its borders, the serum to cost the users only the amount necessary for its manufacture.

The best weapon to use in avoiding so widespread a scourge as cholera is that of co-operation. The federal authorities are helping in this work. The State and Michigan Agricultural College are doing the very best they can under present laws and conditions. The co-operation of organized counties for such work is of inestimable value. The plan as followed in Branch county, where federal, State and county officials are working in co-operation to eradicate the disease from selected areas is reported below. Even where these exact combinations are not worked together, much good can be realized by county organization to control the disease. If local boards of health in the townships, public officials, and citizens would be watchful and careful in reporting suspected cases, much good could be accomplished. Supervisors and all boards of health have power to quarantine and handle such cases until they can be relieved by the State Department, and they can be of great service to their townships by so doing. If farmers will only co-operate and do as they would be done by in keeping infection from their neighbors, much trouble and loss could be avoided. It is no disgrace to have hog cholera break out on the premises, but it is a disgrace to allow it to spread to neighboring herds.

SUMMARY.

Before offering some tentative plans which our Commission have in mind, we wish to summarize by mentioning some points of caution:

1. Do not remove the infected hogs to fresh quarters and leave the well ones to take the infection from the yards and pens.
2. Do not allow hogs infected or exposed to cholera to run upon the highways or run at large. Such hogs should be confined in close quarantine.
3. Do not fail to burn or bury with powerful disinfectants all carcasses of cholera hogs.
4. Do not waste your money in "hog cholera cures," as they are frauds and worthless.
5. Do not expect serum or virus treatments to be cure-alls; and purchase only of those firms known to be honorable.
6. DON'T buy hogs from any person outside of your own community and then only when you are positive that cholera has not and does not exist in that particular place.
7. DON'T allow any persons from infected localities to visit your pens under any circumstances.
8. DON'T visit any place where the disease exists as you can carry the disease to your own stock.
9. The cleaning and disinfection of infected premises is a matter that will vary in detail with each case; therefore affected parties will observe the special oral instructions given by the representative of the Commission to supplement these general directions.
10. Cleaning and disinfection must follow, not precede the proper separation of the well and the affected animals and must be repeated in the event of further cause of the disease in question appearing on the premises.
11. There must be a thorough cleaning of the buildings and yards that have been used by the affected animals; first of all, gross litter such as manure, bedding, fodder, loose woodwork, and any other refuse

capable of harboring the infected discharges of the affected animals must be removed; second, the walls, floor, and ceiling must be freed of all dust and dirt and the yards raked free from all litter.

12. The walls, floors and ceiling cleaned as indicated above must be thoroughly treated with a 3 per cent solution of compound solution of cresol, or other disinfectants equally as effective the yards must be covered with fresh burned lime and this should be followed by whitewashing walls and ceilings.

13. It is hereby made the duty of all local boards of health to whom cases of contagious or infectious diseases are reported to immediately investigate the same either in person or by some member or members of the board or by the employment of a competent and skillful veterinarian. And also to report their findings to the Live Stock Sanitary Commission, Lansing, Mich.

RECOMMENDATIONS.

This Department has given much thought upon this serious question and after receiving many proposed methods of handling the disease in the State, are prepared to make the following recommendations of a plan which we believe to be unique, practicable, and efficient, and a money saving to both hog raisers and the State alike: In cases which are suspected or well defined, the owner of such hogs shall immediately load all hogs in his herd into box cars, the same to be shipped to some packing plant where State or federal inspection is maintained and condemned or used according to the recommendation of the inspector making the inspection. The uninfected animals would then be passed and used for food, while those that have the disease would be put into phosphate, according as their condition would warrant. The owner to get all the receipts above the cost of shipping and handling. We would further recommend that the handling and shipping be entirely in the hands of this Department or an authorized agent, they being the judge of the expediency of this plan or the substituting of serum treatment where advisable.

The movement of an infected herd should be made in tight-bottom racks, and transferred to box cars without the herd having to pass through the public stock yards, these box cars to be plainly marked "exposed to hog cholera." All vehicles, tools, persons handling such shipment, as well as the premises to receive thorough disinfecting immediately. This plan, we believe, would be a decided gain to the owner as he would receive something for his herd instead of allowing them to remain subject to infection, which in time usually results in complete loss. He can then do strenuous cleaning up with the assistance of the State, and restock as soon as satisfactory measures are employed. The public at large would surely be safe-guarded by having all infection quickly removed from the vicinity. This Department, we believe, could make such a plan effective by the co-operation of the local health officers, and permission to restock would rest in the hands of this Department.

We further recommend that legislation be taken which would give into the hands of the live stock sanitary commission control of all distribution of virus, for, while it may be a valuable agent as a preventive, it is acknowledged to be a dangerous proposition in the hands of unqualified persons. We recommend the same supervision over the distribution of all serum, and so called hog cholera cures.

As a final recommendation, which will give value to all other efforts or propositions, we wish to suggest the continuance of the present close co-operation between the Bacteriology Department of the Michigan Agricultural College and this Commission. Valuable work, plans, and scientific knowledge have been received from that Department under Dr. Giltner and his associates, and this commission would be sadly crippled without this co-operation.

REPORT OF STATE REPRESENTATIVE IN BRANCH COUNTY.

Hog cholera control work was taken up in Branch county, Mich., by the federal authorities May 1, 1914. The State College co-operated by securing a census, relative to the number of hogs raised in 1912-1913 and the number of hogs in the county at the present time, which was to be used for comparing results. Educational work among the farmers and the perfecting of township organizations was carried on by Dr. Hallman, associate professor of pathology at the college and Dr. Newton of the government force. Educational work in the form of personal interviews was attempted by myself after June 20 and for which the State College paid one-half of my salary and expenses.

The function of the Live Stock Sanitary Commission has been to see that the proper quarantine and sanitary measures, demanded by the project, were carried out. The quarantine measures which I have enforced during the past six months have been as rigid as I believed necessary to the welfare of the project but I believe that if the work is to be continued it would be advisable to enforce more rigid measures on infected farms.

The disinfecting apparatus has consisted of three small hand spray pumps, which though effective, on a small scale, caused a great deal of delay. We hope in the future to be supplied with a small power disinfecting apparatus. The purchase of the disinfactant has been left to the farmer. If it was supplied it would greatly facilitate the work.

The serum-simultaneous method of immunizing hogs against cholera was administered to well hogs by an Orland Ind., veterinarian and caused outbreaks on thirteen farms, the loss being 136 head which shall be included in the total number of hogs which died of cholera in 1914. I believe that the serum alone treatment should be strictly adhered to.

The attitude of the farmers regarding this campaign so far has been good. In only a few instances did we meet with any opposition and we have every reason to believe that we will have the hearty co-operation of every farmer in Branch Co., if the work is carried on another year.

Cost of maintaining quarantine and sanitation.

(a) Salary of representative paid out of State fund........	$200 00
(b) Expenses of representative paid out of State fund....	279 14
Total	$479 14

Respectfully submitted,
B. B. ADAMS,
State Representative in Branch Co.

HOG CHOLERA COUNTY CONTROL INVESTIGATIONS.

REPORT FROM JANUARY 1, 1914 TO DECEMBER 31, 1914, BRANCH COUNTY. MICHIGAN.

I. *General Statement.*

1.	Number of hogs raised in Branch County in 1912	46,170
2.	Number of hogs raised in Branch County in 1913	55,338
3.	Number of hogs that died of hog cholera in Branch County in 1912	1,209
4.	Number of hogs that died of hog cholera in Branch County in 1913	4,039
5.	Date when headquarters established in Branch County,	Apr. 27, 1914
6.	Date on which first herd was treated	May 28, 1914
7.	Number of outbreaks in Branch County from January 1, 1914, to time of treatment of first herd	6
8.	Number of hogs that died from hog cholera in Branch County from January 1, 1914, to time of treatment of first herd	48
9.	Total number of outbreaks of hog cholera in Branch County since treatment of first herd	90
10.	Total number of hogs that died of hog cholera in Branch County since treatment of first herd	667
11.	Number of hogs raised in Branch County in 1914	57,878
12.	Number of farms in Branch County on which active infection existed at time of treatment of first herd	4

II. *Results in Infected Herds Treated Exclusively With Serum Alone.*

1.	Number of herds treated	84
2.	Number of hogs treated	2,200
3.	Number of hogs showing high temperatures (above 104 deg.) or other symptoms when treated	463
4.	Number of hogs showing high temperatures (above 104 deg.) or other symptoms, when treated, that have died	254
5.	Total number of treated hogs that died	403

III. *Results in Exposed Herds Treated Exclusively With Serum Alone.*

1.	Number of herds treated	36
2.	Number of hogs treated	622
3.	Number of hogs showing high temperatures (above 104 deg.) or other symptoms when treated	28
4.	Number of hogs showing high temperatures (above 104 deg.) or other symptoms when treated, that have died	none
5.	Total number of treated hogs that have died	none

IV. *Results in Infected Herds Where Both the Simultaneous Inoculation and the Serum Alone Were Used.*

The simultaneous inoculation and the serum alone method not used in this county.

V. *Results in Exposed Herds Where Both the Simultaneous Inoculation and the Serum Alone Were Used.*

The simultaneous inoculation and the serum alone method not used in this county.

VI. *Results in Infected Herds Following the Use of Serum Alone on Pregnant Sows.*

1.	Total number of sows treated..........................	23
2.	Total number of treated sows that aborted.............	2

VII. *Results in Exposed Herds Following the Use of Serum Alone on Pregnant Sows.*

1.	Total number of sows treated..........................	6
2.	Total number of treated sows that aborted.............	1

VIII. *Results in Infected Herds Following the Simultaneous Inoculation of Pregnant Sows.*

The simultaneous inoculation method was not used in this county.

IX. *Results in Exposed Herds Following the Simultaneous Inoculation of Pregnant Sows.*

The simultaneous inoculation method was not used in this county.

X. *Miscellaneous Data:*

1. Number of *authenticated* cases of sterility produced by the simultaneous method when used on *well* sows.

The simultaneous inoculation method was not used in this county.

2.	Number of *infected* herds treated with serum alone in which hog cholera later reappeared. (If cholera reapepared a number of times in the same herd, each reappearance should be classed as a herd.).........................	4
3.	Number of *exposed* herds treated with serum alone in which hog cholera appeared later in the season...........	none

4. Number of *infected* herds treated with the simultaneous method in connection with serum alone, in which hog cholera later reappeared.

The simultaneous inoculation method was not used in this county.

5. Number of *exposed* herds treated with the simultaneous method in connection with serum alone, in which natural infection appeared later in the season.

The simultaneous inoculation method was not used in this county.

6. Number of well herds treated by simultaneous method in which hog cholera appeared as the result of treatment.

The simultaneous inoculation method was not used in this county.

7.	Percentage of abscesses resulting from treatment	2.16%
8.	Total number of hogs left untreated on account of advanced disease	328
9.	Number of hogs left untreated on account of advanced disease, that have died	264

XI. *Sources of Infection or Ways in Which Hog Cholera is Spread.*

		(cases)	(%)
1.	Exchanging labor and visiting neighbors	11	12.22
2.	Exposure to sick hogs in adjoining pens or pastures	5	5.56
3.	Infection harbored on premises	10	11.11
4.	Carried by dogs	2	2.22
5.	Infected cars and public highways	..	....
6.	Purchase of new stock	2	2.22
7.	Contaminated streams	3	3.33
8.	Birds	15	16.67
9.	Stock yards	6	6.67
10.	Simultaneous treatment by local veterinarians	12	13.33
11.	Indefinite	24	26.67

XII. *Present Situation in Branch County.*

Referring to Section XII of the present situation in connection with the Hog Cholera Control and Eradication Work in Branch County, I beg to offer the following explanation in regard to the enclosed report.

Referring to the General Statement, Questions 1, 2, 3 and 4, I do not believe the census showing the number of hogs raised in Branch County in 1912 and 1913, and the number lost by cholera during these two years, to be accurate. It was found while taking the census that many farmers could not remember the number of hogs raised during these years, or the number lost by cholera, and I believe that an accurate census would show at least 55,000 hogs raised in 1912, and at least 2,000 lost by cholera during that year. It is also probable at least 60,000 hogs were raised in 1913, and at least 5,000 were lost by cholera.

Referring to Section 1, Question 9, which refers to the total number of outbreaks of cholera since treatment of the first herd, I beg to advise that this number (90) includes 12 herds which had been given the simultaneous treatment, and in which cholera later developed. Of these 12 herds, 6 were later treated by the Department, and 6 were not reported until after the disease had abated.

Referring to Section 1, Question 10, total number of hogs that died of hog cholera since treatment of first herd, this number (667) includes 136 lost as the result of the simultaneous treatment administered to well herds by veterinarians from Orland, Indiana, and about 70 in herds that were not reported to this office until either all of the hogs were dead, or too sick to treat.

In regard to what has been accomplished towards the control and eradication of hog cholera in Branch County, I believe the most important feature that has been accomplished, is the education which the farmers have derived through our demonstrational work, personal interviews, and educational meetings which have been held throughout the county. The work this year has familiarized the farmers with the nature of our work, and has served to instill a spirit of confidence among them, which will serve as a basis for the further continuance of the work.

I have reason to believe that the loss in the county this year would have at least equalled, or excelled those of last year, had our work not been carried on in the county. The enclosed report shows the loss this year to be about 16% of that of the previous year. The losses in surrounding counties where no control work has been done, have exceeded those of previous years. A survey is being taken in St. Joseph County at this time, which will show the losses in that county during the present year. As soon as this data is available, a copy of the same will be forwarded to the Bureau.

Concerning the attitude of the farmers in regard to our work, will say that at this time there is very little opposition. When the work was first taken up, we met some opposition, particularly due however, to a misunderstanding. There had been considerable unsatisfactory results following the use of the simultaneous treatment, and many farmers had been induced to use certain hog cholera specifics, all of which had caused them to lose confidence in the value of any remedy or preventative for hog cholera. They also feared that undue hardships would be imposed upon them through quarantine measures, but after an explanation of our methods had been given, and a clear understanding conceived by the farmers, little or no opposition was met with. In several localities, some unsatisfactory results following treatment, served to bring about an adverse opinion of the work among residents of that community, but during the latter part of the season, work in those particular communities has been sufficiently satisfactory to reestablish a spirit of confidence. On the whole, I believe the farmers are well satisfied with the work as it was conducted this year, and I anticipate a hearty cooperation among them, if this work is continued in the county.

Relative to the assistance that has been furnished by the parties cooperating with the Bureau in this project, I will state that very valuable assistance has been rendered by the Branch County Farm Bureau, the Michigan Agricultural College, and the State Live Stock Sanitary Commission. When I arrived in the county, I found the County Agent, Mr. J. W. Chapin had the preliminary work well under way. He had taken up the matter of establishing the hog cholera control work in the county with the County Board of Supervisors, and had induced them to appropriate the sum of $200.00 to assist in defraying expenses of securing the survey. The Board of Supervisors also promised to secure the survey while making up the assessment roll of the county, but this method proved unsatisfactory, and it was necessary for the representatives of the State college to either secure the census themselves, or to hire representatives in certain townships to make a canvass of their townships. Mr. Chapin assisted us very materially in our educational work in the township meetings, and through bulletins issued by the Branch County Farm Bureau.

The Michigan Agricultural College delegated Dr. E. T. Hallman, associate Professor of Pathology, to assist us in the educational work, and in perfecting the county survey and organization. Dr. Hallman handled this phase of the work in a very commendable manner, and much credit is due him for the cooperation which we have received from the farmers.

Dr. Ward Giltner, Professor of Bacteriology, at the Michigan Agricultural College, has also been with us from time to time for the purpose of addressing meetings. The State Live Stock Sanitary Commission has had a representative in the county to look after the quarantine and sanitary measures, and Pres. H. H. Halladay and Mr. Martin Stapleton, members of the Commission, have been in touch with the work in the county during the summer, and have rendered valuable assistance in the furtherance of our work.

On the whole, the assistance rendered by those cooperating parties, has been very satisfactory, and any success that may have attended our work in the county, is due in a large measure to their assistance.

We have every reason to believe that the work in this county can be continued more successfully, as we will have the benefit of this year's educational work, organizations and the cooperation already established.

We have been assisted in every way possible by practically every local veterinarian in the county. These men have turned all of their hog cholera work over to this office, and have been cooperating in an educational way whenever possible.

In the beginning of the hog cholera season, or in an isolated outbreak in an otherwise noninfected territory, I believe it advisable to surround the outbreak with treated herds.

I believe the policy of the serum alone method should be continued in the county, and the proclamation issued by the State Live Stock Sanitary Commission prohibiting the use of virus in the county, should be rigidly enforced. While the quarantine measures have been enforced this year as rigid as was consistent with conditions, I would recommend that a more rigid quarantine be enforced on infected premises, and this, I believe, can be done without losing the co-operation of the farmers, as a better understanding of the work exists among them.

The disinfecting apparatus that has been used by the State during the past year has been inadequate, and impractical. I recently took up the matter of purchasing a power spray disinfecting apparatus, with Mr. H. H. Halladay, of the State Live Stock Sanitary Commission, and was assured by him that a power sprayer would be purchased for use in the county next year.

A short time previous to rendering our November report, we treated a herd of hogs belonging to Mr. I. B. Sweeney of Noble Township, which were in a very unthrifty condition from lack of feed and care. Eighty-three of these hogs have died since treatment. We have included this in the 'total number of hogs lost in the county,' and also in the 'total number lost after treatment.' It is probable that this loss was due more to lack of feed and care than to hog cholera. About thirty abscesses developed in this herd, which were due to unsanitary conditions in which the herd was kept. We retreated a herd of sixty-eight hogs belonging to Mr. Emanuel Weaver of Noble Township, which had been treated simultaneously by Mr. Stayner, a local practitioner, and in which cholera developed as the result of treatment. In this herd, we found about eighty-five per cent with abscesses due to Mr. Stayner's treatment. Ten abscesses resulted from out treatment, and these were all in hogs that had abscesses as the result of the first treatment. I attribute the large percentage of abscesses to the infection which was present when the hogs were treated.

Respectfully submitted,
H. M. NEWTON,
Inspector in Charge.

REPORT OF THE PATHOLOGIST.

E. T. HALLMAN.

Section 4, paragraph 5630, of the State Live Stock Sanitary Laws authorizes the Commission to provide laboratory facilities for the investigation of infectious diseases of live stock. The Bacteriological Laboratory of the Michigan Agricultural College has been designated the official laboratory of the Commission and it has been the privilege of the writer to serve the Commission as pathologist for the last 16 months. During this time numerous specimens of diseased animal tissues have been forwarded to this laboratory for diagnosis and a large number of blood samples from cows and horses for examination for evidence of infectious abortion and glanders respectively have been received. It has also been the privilege of the writer to investigate a number of reported cases of infectious diseases of live stock throughout the state. There has been a close relation between the Live Stock Sanitary Commission and the Bacteriological Laboratory for a number of years and this relation has become more intimate during the past three years. For the two years prior to the appointment of the writer as Pathologist to the Commission, Dr. Ward Giltner who was a member of the staff of the Bacteriological Laboratory at that time and now head of the Department, served as State Veterinarian. We believe we are justified in saying that this relation has resulted in much benefit to both departments rendering the service of each to the people more effective. Not only has the writer answered numerous calls of the Commission, but other members of the staff, and especially Dr. Giltner, Head of the Department, have from time to time advised with the Commission relative to the control of infectious diseases. Especially in connection with the control and attempted eradication of hog cholera has this laboratory been of service to the Commission. Dr. L. R. Himmelberger, who is occupied with investigations relative to the nature of swine diseases and Mr. W. S. Robbins who has direct supervision of the serum production carried on by this laboratory have added materially to this service.

We cannot over-estimate the good effects this relation has had on the Bacteriological Department. It has not only resulted in bringing us into closer touch with the farmers of the state, thereby broadening our field of activity, but has afforded us much material and experience, which has been of great use in class room and laboratory work.

INFECTIOUS ABORTION OF CATTLE.

Experiences gained through personal investigation, correspondence and conversation demonstrate that this disease is much more prevalent in Michigan than many suppose. While many causes have been advanced for abortion in cattle such as mouldy feed, ergot, blows, kicks, falls, etc., we cannot deny the fact that the majority of abortions are caused by the bacterium of Bang infecting the uterus and foetal membranes of the unborn calf.

In the majority of cases the disease is probably introduced into the herd through the purchase of a female animal, however it may be introduced by breeding to a bull in an infected herd or through the purchase of a bull from such a herd. When introduced it is believed that the disease may exist in a herd for a few years before abortion occurs. That is, not all affected cows abort, soon after infection. In fact there is evidence that a cow may harbor the infection for many years without ever aborting. It should be remembered that while abortion may occur as a result of infection, it is not the only manifestation of the infection. It may cause retained placenta and sterility.

If a single abortion occurs in a herd there are no symptoms by which it can be definitely determined that the cause is infectious. We believe that by a blood examination this fact can be determined with a fair degree of accuracy. From what has been said above, it will be seen that the test will not determine an impending abortion. A positive reaction to the test indicates that the animal is infected with the Bacterium of Bang but whether abortion, retained placenta, or sterility will result, only time will tell.

The Bacteriological Department of the Michigan Agricultural College, East Lansing, will make this test without cost for any farmer of the state who will send about 1 ounce of blood from each animal to be tested.

As to the control and eradication of this disease we have no entirely satisfactory method to offer. There are a number of so called abortion cures and preventatives on the market, none of which we can recommend. That is, we know of no remedial agent which can be given to a pregnant animal that will prevent an impending abortion.

Some have suggested disposal of the aborting animals when it first makes its appearance in a herd. We cannot hope to eradicate the disease in this way, since not all the affected animals in the herd will abort and only those actually aborting will be disposed of by this plan. It should be remembered that though an animal does not abort, if the infection exist in the genital passages such an animal is a source of infection for all other animals in the herd.

In the majority of cases when an abortion occurs in a herd the infection is already pretty well disseminated. The only plan by which we can hope to accomplish much good is one which will include in it every animal in the herd. Each animal should be considered as harboring the infection and handled in the same way as though abortion had occurred.

Any satisfactory and effective plan will entail considerable work and one cannot hope for good results unless willing to fight persistently for a period of several years. The disease is a chronic persistent one and can not be controlled by a few months of work.

The plan we suggest is one with which we have had some experience and which we know will bring good results when faithfully applied. We don't claim that by it the disease can be completely eradicated, but after one or two years its effects can be reduced to a minimum. The plan we offer is as follows:

Cleanliness in the care of the herd is of primary importance. This necessitates properly constructed buildings that can be effectively cleaned and disinfected. Each breeding female should be groomed frequently and the buttocks, tail and hind limbs sponged with a disinfectant two or three times a week. This is essential because there is usually a slight (sometimes profuse) discharge from the genital passages of an affected cow which continually soils the rear parts of the animal and since cattle frequently lick each other the disease may be acquired in this way. The infection may not only be introduced through the genital passages, but may be introduced through the mouth. For this reason the feed and water should be guarded against contamination with the genital discharges.

When an animal is about to calve or is showing signs of abortion, she should be removed to a clean maternity stall, containing clean bedding and kept there until the genital discharges cease. The bedding contaminated with these discharges should be either burned or removed to fields not used by cattle and turned under as soon as convenient. If the animal does not clean after delivery, the afterbirth should be removed by a qualified person. Once a day after delivery the animal should receive injections into the genital passages of some mild, non-toxic antiseptic and the external parts likely to be soiled by the discharges should be sponged daily with a disinfectant. Vaginal douches should be given daily as long as there is considerable discharge, thereafter three or four times a week until the discharges have ceased.

The maternity stall should be frequently cleaned and sprayed with a disinfectant. After abortion, breeding should be deferred to at least five or six months. At the time of breeding the sheath of bull should be irrigated with a mild antiseptic and the inferior abdominal surface of the bull should be sponged with a disinfectant before and after service. For vaginal douches and irrigating the sheath of bull, a fountain syringe with a piece of aluminum tubing about 14 to 16 inches long in the free end of the rubber tubing can be used. If the tubing is rather stiff, the metal tubing will not be necessary. In the absence of a fountain syringe one may use an ordinary funnel and a piece of rubber tubing three to four feet in length. In each case the solution should not be injected with force but should be allowed to gravitate. In making vaginal injections the tube should be inserted a distance of 6 or 8 inches, and about 1 quart of the solution introduced, in the case of antiseptics. In irrigating the sheath of the bull, the tube should not be inserted more than 2 to 3 inches. With one hand grasp the sheath gently around the tube while an attendant raises the syringe or fills the funnel, and after filling the sheath it should be massaged gently with the other hand so as to force the solution into all the folds.

Great care is to be exercised in making injections, remembering that improper treatment is worse than no treatment at all. Drastic measures or strong antiseptics should never be used. For vaginal injections and irrigating the sheath of the bull, 3 or 4 teaspoonfuls of compound solution of iodine to 1 gallon of water or two teaspoonfuls of compound solution of cresol to 1 quart of water may be used. Clean water that has been boiled and cooled should be used for making this solution.

For vaginal douches, cultures of the lactic acid bacillus may be used instead of antiseptics. These have the advantage over antiseptics in being non-irritating and in the hands of the writer håve given good results. The method of preparing this whey is as follows: Place fresh skimmed milk in a clean vessel and add a culture of the lactic acid organisms (cultures may be obtained from this laboratory at 25 cents each or creamery starter may be used if one is conveniently located relative to a creamery). Set in a warm place (70-80°F.) until a firm curd has formed. Break this curd up into a number of small pieces with a clean rod or spoon and filter through clean cheese cloth into clean fruit jars. This whey is to be injected in about 4 to 8 ounce doses daily, until discharges have ceased.

Fresh whey should be made up at least once a week and kept in a cool place until used. If too much acidity has developed it may be diluted by adding water that has been boiled and cooled. Whether this is needed may be determined by tasting. If irritating to the mouth it should be diluted.

In warm weather it is sometimes difficult to keep sour whey prepared in this way longer than two or three days. Under such conditions the following method of preparation is suggested: Bring fresh skimmed milk to about 85°F. Add one dram of rennet in an ounce of clean water to a gallon of this milk, stirring constantly while adding. Let stand until a firm curd has formed. This will require 10 to 30 minutes. Break the curd up into several pieces, heat to boiling point and filter through cheese cloth. Place the whey in sterile fruit jars and sterilize by setting the jars in a boiler of water and boil for about 30 minutes to one hour each day for three consecutive days. When boiling for the first time the tops and rubbers should be placed loosely on the jars but as soon as the boiling process ceases should be immediately tightened. At subsequent boilings the tops should be left undisturbed. It is suggested that some old towels or a woolen rack be placed in the bottom of the boiler to prevent the jars coming in contact with the bottom of the boiler. Whey put up in this way can be kept almost indefinitely. When desired for use take that quantity of whey needed for two days' treatment and add a culture of the lactic acid organism and set in a warm place. In one to two days, enough acidity should have developed for use. Occasionally the lactic acid organisms fail to grow in whey and it should always be tasted before using. A sour taste indicates that the organisms have been active.

For cleaning the external parts of cow and bull, 2 parts compound solution of cresol to 100 parts of water should be used and for disinfecting the barn 3 parts of the same solution to 100 parts water should be used. Quick or hydrated lime should be freely used about the barn.

The average dairyman is apt to become discouraged with any plan requiring considerable work and necessarily extending over a period of several years and is apt to resort to the use of some of the widely advertised abortion "cures." We cannot condemn such a procedure too severely. We have yet to learn of the first case where good results can be attributed primarily to the internal administration of medicinal agents. In the light of our present knowledge the disease is a local infection, and while we hope some drug may be discovered which when given by way of the mouth will be taken up by the blood stream and reach the seat of infection in sufficient quantity that destruction of the infection will result, as yet we are familiar with no medicinal agent by which this result will be accomplished.

Until we have more light on the subject we can only recommend sanitation, disinfection and local treatment of the affected animals as indicated above.

REPORT OF THE STATE VETERINARIAN.

Hon. H. H. Halladay, President, Michigan State Live Stock Sanitary Commission, Lansing, Mich.:

I herewith beg leave to submit the Fifteenth Biennial Report of the State Veterinarian:

In September, 1913, under the amended act of 1913, No. 199, my term of office as State Veterinarian began. Under the new order of things, providing for an office in Lansing for the State Veterinarian, it took several weeks to get established in our office and arrangements made to take care of the live stock sanitary work of the state.

Since that time, I have been called upon to visit almost every county in the State on account of alleged outbreaks of contagious diseases of live stock. In the majority of these cases, we found well-marked evidence of contagious diseases, where, in order to protect the health of the live stock, it was necessary to enforce quarantine regulations. In respect to these outbreaks, the work of your Commission has been two-fold in its services: First, by its efforts to restrain and stamp out contagious diseases among our live stock, thus preserving the wealth of the state; second, and of more vital importance, protecting the health of the people by destroying or rigidly quarantining those animals effected with such diseases as are communicable to mankind. It is not my purpose to make this report in the form of a treatise on contagious diseases, but will mention some of those diseases with which I have come in contact in attending to the duties of State Veterinarian.

DISEASES OF HORSES.

Among horses, glanders has been the principal contagious disease to which my attention has been called.

Glanders may be defined as a contagious, constitutional disease of the genus equi (horses, asses, and mules), readily communicable to man, dogs, cats, rabbits, and the guinea pig. It runs a variable course until it causes the death of the animal effected with it. It is subject to various complications of the lymphatic glands of the lungs, all of the internal organs, and of the subcutaneous connective tissue.

In order to understand the different lesions that may be found in a stable where several animals are effected, it must be understood that glanders and pharcy are one and the same disease, differing only in that the term "glanders" is applied when the disease is shown in the lungs and air passages accompanied by a discharge from one or both nostrils, and the term "pharcy" is applied when the principle lesions are shown in the skin and superficial lymph glands.

This disease is frequently found in the most insidious forms, and I believe it can exist without being apparent, that is it may effect an animal for a long period without showing symptoms that would enable the most experienced veterinarian to make a positive diagnosis. Happily for the protection of the public, a test has been discovered whereby the disease may be identified where no positive symptoms have made their appearance. This is known as the mallein test. A liquid has been made from pure cultures of the germ of glanders known as the bacillus mallei, properly sterilized, named mallein, which, either by injection subcutaneously, or applied to the eye of an animal effected with glanders, produces certain changes that are not apparent in the animals free from the disease.

The symptoms of glanders are many and varied, and owing to the fact that a number of these symptoms closely resemble those of other diseases, none but the careful veterinarian should attempt to differentiate between them, as a mistake in diagnosis might lead to the destruction of a harmless and useful animal, or on the other hand, a case of chronic glanders might be overlooked that might cause serious results by spreading the disease among the animals or even to man himself. Consequently, I would advise the horse owner in any case where he has an animal with a discharge from the nostrils that has continued for several months to call in a veterinarian and if doubts arise in the mind of the professional man, it would be wise to apply the mallein test.

Instance after instance have been recorded where a horse affected with chronic glanders in a mild form has escaped the notice of the owner until a number of his stable companions have become affected with the acute form of the disease.

I wish to emphasize the fact that all glandered animals when destroyed should be either burned or buried very deeply, in order to keep the carcass out of the reach of dogs, as carnivera are susceptible to the disease from eating the flesh of a glandered animal. A case is recorded where a pack of wolves in the Philadelphia Zoological Gardens died within a short period after being fed with the meat of a glandered horse. Owing to the extreme susceptibility of the dog and cat to this disease, and that they are in many instances, playmates of children, the greatest caution should be exercised in putting carcasses of glandered horses completely out of the reach of these animals.

Experience with glanders has demonstrated to me that eternal vigilance is necessary in the control of this disease, as a number of cases have developed in one locality in this state, originating by the bringing into the state of one glandered animal. I would earnestly recommend to your honorable Commission the necessity of having an amendment to our Live Stock Sanitary Law by our present legislature, preventing horses being brought into the state for permanent use without first being subjected to the mallein test. Within the last year, about twenty horses have been destroyed and scores of others exposed to glanders, all traceable to horses being brought in from the western states. Many other states have taken this wise precaution and there is no reason why we should be a dumping ground for diseased animals of this kind. I wish to call your attention to the fact that owing to the importation of one glandered animal from the west in March, 1913, it became necessary to destroy fourteen valuable horses, worth at least $2,500, besides disinfecting a number of barns and stables and the chance of many other animals being infected. This alone is sufficient reason why our laws regulating the shipment of horses into the state should be so amended as to give us the protection against this serious malady among horses and other susceptible animals in our state.

RABIES.

Another disease that has caused your Commission much concern is rabies, and a number of cases of this frightful malady have made their appearance in the state during the past two years, and several persons have been bitten by rabid dogs, but, fortunately, they have taken the Pasteur treatment in time and have been saved from death in the most terrible form imaginable.

Believing that each succeeding year will see an increase of the ravages of this dreaded disease unless some more radical measures are taken for its suppression, I deem it prudent to call the attention of the public through your honorable Commission to the fact that the Commission should be empowered to restrain all dogs in a quarantined district by having them securely chained instead of simply being muzzled, and the destruction of all dogs on sight that are found running at large.

Rabies may be defined to be a disease effecting principally the nervous system, shown by restlessness, irritability, fury, paralysis, and death, caused by the bite of an animal similarly affected, communicable by inoculation with the saliva from an infected subject having a long and variable period of incubation, sometimes covering a period of several months. This disease must be considered only from a contagious standpoint, as the theory of the spontaneous generation of rabies is unworthy of consideration. Strange to say, many eminent men in the past have believed in the spontaneous generation of rabies, but these same men held that tuberculosis, glanders, and many other similar diseases originated spontaneously, but the belief in the origin of these diseases in the absence of contagion has died out since the discovery of the true cause of contagion.

Who today that has given any study and thought to this subject believes in the spontaneous origin of tuberculosis or glanders? We know positively that these diseases are due to parasites of the nature of bacteria that must first find their way into the animal before the disease through the germ or seed can develop. That the same is true of the contagion of rabies follows from analyty and is confirmed by the failure of the disease to develop in Sweden and Norway since its eradication from these countries. More recently, we have seen the disease in Great

Britain reduced from six to seven hundred cases per year to about a quarter of a hundred cases per year by a few years' intelligent repression. Surely this result could not have been attained if the disease originated spontaneously. Furthermore, investigators who have tried from time to time to produce it by keeping dogs under conditions which were said to cause it have uniformly failed. From the time of Aristotle, 322 B. C., until the present day, we have clear accounts of this disease existing through every age and provoking fear and horror in every country where it existed. It was always credited to the bite of some animal, which animal was invariably alleged to be rabid.

Scientific investigation and experience have clearly demonstrated that rabies is an acute specific disease, due to a specific cause, a living germ that is transmitted by inoculation only. This process when it is accomplished is brought about almost without exception by an animal which is suffering with the disease, conveyed to the wound inflicted by its teeth, either on another animal or upon man, saliva which contains the virus. It is possible that the virus may be conveyed to the wound of man or beast without the subject being bitten, as the virus has been found to exist in the salivary glands or saliva, the mammary glands, milk or pancreas lachrymal glands, and supra-renals. Consequently, it is of the utmost importance that the public should be warned of the danger of handling animals supposed to have died of rabies, if they have any wounds or slight abrasions of the skin that might come in contact with the saliva.

SYMPTOMS.

The symptoms of rabies are not always as clear and distinct as described in the text-books upon such subjects. The disease is usually marked by three different stages. We have, first, the pro-dromal symptoms, second, the furious symptoms, or those of the attack proper, and third, the paralytic symptoms, or those of the final stage. The symptoms of the first two stages may be so slight as to escape notice, but still there exists the paralytic form of the disease.

In man, the pro-dromal symptoms are indisposition toward sleeplessness. The attack is ushered in by difficulty in swallowing, particularly liquids, which is due to spasm of the muscles of the pharnyx. The spasms soon extend so as to involve the muscles of the neck and later those of the body and limbs. Any attempt at swallowing at this stage is sufficient to bring on a violent attack of general convulsions.

It is stated even the sight of liquids at this particular stage, although the animal seems to have intense thirst, will frequently bring on convulsive attacks. It is this peculiar, characteristic stage of the disease that has given rise to the term "Hydrophobia." Those who have witnessed this form of the disease in man have characterized it as being of the most terrible nature and the suffering of the patient as being beyond description.

An apparent change in disposition and signs of irritation upon being disturbed, either by persons or dogs, is characteristic of the first state of the disease in the dog. As the disease progresses, owing to paralysis of the muscles of the larynx and his bark or howl is said by those familiar with the disease to be one of the distinguishing symptoms. As the disease progresses, he is almost sure to wander away from home, snap at everything that comes in his way, and if he is naturally a vicious dog, he will go out of his way to attack persons or other animals.

If not killed, the dog will frequently return to his home. The paralysis rapidly extends to the muscles of the lower limbs and trunk, involving the muscles of respiration, and he dies in a short time.

In the cat, we generallly have the furious symptoms and in attacks, she flies at the hands and face, while in the rabbit, we usually have the paralytic symptoms, especially in the hind limbs. The duration of the disease is generally from four to five days, but in rare cases in the dog it has been known to last eight or nine days. In regard to rabies, it should be borne in mind that these well marked symptoms are not always present. In some cases, the general demeanor of the animal is so little altered that the disease progresses so slightly that there is opportunity to do a great deal of harm before he attracts serious attention. It is those cases that do not show characteristic symptoms of rabies that have a tendency to give the animal a chance to do the most serious damage. In the horse, cow, sheep, and pig, we have very little difference in the symptoms from those of the dog, with the exception that these animals do not show the same disposition to roam and usually little, if any, tendency to bite. The horse and pig are dangerous in this respect.

The paralytic stage of the disease, however, is constant in all animals before death, which usually follows in from one to three days.

PERIOD OF INCUBATION.

There is no fixed period of incubation. Such eminent authorities as Pasteur,. Hartwick, and Prof. Ray (Veterinary School, Lyons, France), say it varies from thirteen days to twenty-four months. Pasteur says these variations depend not upon the virulence of the virus but upon the amount absorbed. However, each individual has fixed the time of his own actual experience, which has shown a marked degree of variation. Sir Thomas Watson of London, England, fixed the incubation period in man from six weeks to three months, although he admits that it may be a much longer period. He reports a case where six dogs were bitten at the same time. The first one went mad in twenty-three days and the last of the six in one-hundred and eighty-three days.

In my own opinion, Dr. Abba, in referring to the dog, has given us the most sound advice. He says that the period of incubation is so variable that it has been known to last two hundred and forty-six days and the only safe rule is to kill all dogs that are suspected of having been bitten by a rabid animal at once.

CONTROLLING AND ERADICATION OF RABIES.

Experience in some of the European countries have demonstrated that this dreaded disease can be controlled by active measures on the part of those that have the power in their hands to adopt radical measures in regard to its suppression; and when we consider for a moment the extreme suffering of the unfortunate victim of this terrible disease we must naturally feel that no measures, however radical (if consistent with the laws of the state) can be otherwise than justifiable in our endeavors to stamp out an outbreak of rabies.

The complaints of suspected cases of this disease require more than an ordinary investigation. From the fact that the early symptoms of a case where an animal is suspected vary so much, and the tendency of some dog owner to give his dog all the benefit of the doubt, I believe the only rational way to handle these cases where the owner insists in keeping his suspected dog is to compel him to keep him firmly chained in a room or enclosure where neither man or beast can come in contact with him and not allow him to be released under three months unless a laboratory test of the head of the dog that bit him does not reveal the negri bodies or rabbits inoculated from the brain or spinal cord show no signs of the disease.

To illustrate what may be done by stringent measures in efforts to control this frightful malady, allow me to quote from Prof. Fleming's report before the International Congress of Hygiene and Demography, London, England, August 10th, 1891. He states as follows: The value of muzzles in the suppression of rabies has been perhaps best demonstrated in London on several occasions and especially in 1885. Previous to this time, hydrophobia had increased to a very alarming extent in England and no steps worthy of note had been taken to check the mortality. In London alone twenty-seven deaths were due to the bites of rabid dogs. A strict muzzling order was then enforced and at the end of 1886 not a single death was recorded. Unfortunately, the muzzling order was then rescinded and in a few months a case of rabies occurred in the south of London which was soon followed by others and in 1889, ten deaths were registered. In July of that year, the muzzling order was again issued and stringently enforced and the disease again disappeared.

In Sweden, where the disease at one time was very common, they have applied the muzzles and other radical measures until the disease has been unknown since 1870, although before these measures were introduced, from eight to ten people died of rabies annually. This being the case is it not our duty with the help of the local board of health to carry out the most stringent measures within our province, not only for the control of this dreadful disease but with a view to its ultimate eradication from our state; and if our present laws are inadequate, then urge upon the legislature the necessity of having such sanitary laws enacted as are necessary to carry out this work.

TREATMENT.

In the treatment of this disease, we must bear in mind that preventative measures are certain if taken in time but must be resorted to as soon after the person is bitten as possible, as there is no known remedy for rabies after it has once set in. There are two methods of treatment at the present time; one, the original Pasteur treatment with the attenuated spine of rabbits effected with the disease and the other with the serum. Either system of treatment can be given at the Medical Department of the University at Ann Arbor, and the serum treatment can be administered by physicians in the home if necessary, but in all cases, I would recommend that the treatment be begun at the earliest possible moment before the symptoms of the disease develop.

The Pasteur treatment has withstood the test for a number of years with scarcely a single failure and has saved thousands of human beings from death in the most pitiful and horrifying form, and has proven its worth in every civilized country.

FOOT AND MOUTH DISEASE.

Many inquiries are being made at the present time in reference to cause, nature and spread of apthous fever or foot and mouth disease as it is commonly called, and I believe it well in this report to give a summary of the history and description of the malady as it appears in this part of the world.

Apthous fever, or foot and mouth disease, is a febrile infectious and highly contagious disease, generally affecting cloven-footed animals, although dogs and cats and even man are susceptible. Cattle and swine seem to respond to the contagion more readily than sheep and goats and the large herbivora found in the zoological gardens contract the disease quickly after exposure. In mankind, if it shows itself at all, it is generally in children that contract it through the drinking of milk of cows that are infected.

This highly contagious disease made its second appearance in this state in the latter part of August, 1914, in a dairy section in Berrien county, and spread to one or two of the neighboring counties in Indiana. The fact that the disease was so mild in its character that it caused no particular alarm among the owners of the herds first affected, and having made its appearance at threshing time among the farmers when the machines and men were moving from farm to farm, it became widely distributed in the neighborhood within a very short period. The fact that in some herds, the disease was so very benign and mild in its character that it did not even attract the attention of the owners of the herds, the milk was carried to the creamery as usual, and the disease distributed over a wide area by feeding the pigs on the skimmed milk.

Up to the present time, the origin of this outbreak has not been discovered nor has the starting point been definitely established.

The disease in this state was confined to one county alone until the purchase of feeders from the Chicago stockyards disseminated it throughout the state until fourteen counties were affected. Fortunately for the live stock interests of the state, your Commission issued a quarantine against cattle coming into the state from these infected yards in Chicago, which action, no doubt, was a saving of many thousands of dollars to our state.

At the present time, all infected herds in this state have been destroyed, and we are under the impression that the great danger of further infection is passed.

Owing to the very active and earnest co-operation between the state and federal officials, the disease outside of the county of Berrien was not allowed to spread to any extent outside the farm where the official animals were taken when purchased at the stockyards.

A brief description of the disease might be of interest at the present time as inquiries are frequently made in regard to its nature and symptoms.

The disease is ushered in usually by febrile symptoms and dimunition of the secretion of milk in dairy cows, followed by a vesicular exanthema developing in the mucous membrane of the tongue, inner parts of the lips and mouth, especially on the dental pad, and in the inter-digital spaces between the hoofs. In milk cows, it occasionally shows small vesicles on the udder and teats. Occasionally we might find vesicles or ulcers around the coronary bands at the upper part of the hoof, but this condition is extremely rare in this country in cattle but more common in swine. Although accompanied with a high fever at the outset, during the formation of the vesicles, the elevation of temperature only lasts from eighteen to twenty-four hours, when the vesicles burst and an extensive drooling at the mouth begins and continues from twelve to eighteen hours. When these vesicles burst, they leave abraded surfaces which are very red in appearanc, but begin to heal rapidly. About this time, the animal begins to show lameness, in the majority of cases, and vesicles appear in the cleft of the hoofs and soon rupture, showing abraded surfaces which frequently become infected from dirt and other pathegenic germs, producing necrosis of the tissues, which condition is generally accompanied by a foeted odor. Like the affections of the mouth, these conditions are of rather short duration when we consider the acute condition noted in many animals.

We frequently notice in very heavy and especially in fat animals, an apparent intensive laminetis which frequently causes a separation of the hoof wall at the caronet; but in this country, this condition seems to be the exception and not the rule.

In the early part of the present outbreak, the disease appeared in the most benign form, scarcely attracting the attention of the numerous farmers where it appeared in their herds, the cattle only showing inappetance for about two days, and in milk cows, a dimunition in the secretion of milk for a short time.

In cases where an animal showed foot lesions and lameness, the disease seemed to show itself for a longer period, but in all cases, the animals had reached their normal condition in from two to three weeks. This early convalescence and in many cases speedy and complete recovery, led many people to look upon the destruction of the animals as a needless waste. But it must be borne in mind that for a long period after recovery, the animal remains a carrier of the infection and is not immune to a second attack. This fact alone is sufficient to justify the destruction of all infected herds.

The affection of the mouth is almost constant in cattle but is less frequent in sheep and hogs, the lesions showing in the feet of these animals to a greater extent. In the beginning of the attack, the animals chew their food slowly on account of soreness of the mucous membrane of the mouth, and when not attempting to eat, they keep the mouth closed, but frequently open it with a peculiar smacking sound which seems to be a characteristic symptom of the disease. The vesicles appear in the mouth shortly after the animal shows any indisposition and may be very small, especially in the smaller animals such as sheep and swine, and varies very much in cattle, varying from the size of a pea up to an inch or an inch and a half in diameter. As a rule, the vesicles do not stand out very prominent, but seem to lie flat along the surface. They are easily ruptured, especially those on the lips and gums and on the muzzle when they make their appearance there. The walls of the vesicles on the tongue are much thicker and seem to lie so flat on the surface that they are scarcely noticeable until they are ruptured. These vesicles contain a yellowish serum which seems to be loaded with the virus of the disease, as inocculation from the contents of these vesicles seems to produce the disease very rapidly. The walls of the vesicles peel off rapidly after being ruptured, leaving a reddened surface, which immediately begins to heal and the healing process is very rapid unless infected with germs of some other character. The lesions do not appear to penetrate deeper than the skin, consequently the abrasions that are left are not long in resuming a normal condition, leaving no cicatrices of any extent to show where the surface has been affected.

The appetite returns as the healing process develops and in a very few days normal conditions are resumed unless the abraded surfaces become affected with necrotic or other malignant organisms.

One fact apparent in the present outbreak is the increased virulence as the disease passed from one herd to another. In the first appearance of the outbreak, the disease was so mild in its nature that it scarcely caused more than a passing notice, but as it passed along from one herd to another, it seemed to increase in virulence until many animals showed very acute symptoms. The fact of this peculiar increase in virulence may account for some of the very severe forms of the disease described in our European literature much more virulent and destructive than has ever been noticed on this continent.

It is well to bear in mind when our suspicions are aroused in regard to an outbreak resembling apthous fever, that we need not look for the extreme lesions that are described in the European text books in dealing with this subject, as we usually find it in a much milder form in this country than it appears to show itself in the European countries, as if we are looking for a disease that corresponds in its symptoms and lesions to the European description of foot and mouth disease, we may be a long time in finding it. I do not believe that these extreme conditions ever appear in this country, and especially at the beginning of the outbreak. It may be possible that after the disease has run a course of several months and the virus passed through a number of herds, we may get these extreme conditions, but I am quite certain we will never find them developing at the beginning of an outbreak.

Under the regulations that were in force during the outbreaks of 1902 and 1908, the Federal Government paid 66⅔% of the appraised value of the herds that were destroyed. But since that time, the regulations have been modified so that at the present time the State and Federal Government each pays 50%. Altogether 2,939 head of cattle have been destroyed, 3,993 hogs and 852 sheep, having an appraised value of $209,199.24, half of which has been paid by the state. This at first glance may look like a large amount for the tax payers of the state, but when we consider that the amount expended in this way covers an insurance on 1,521,000 cattle in the state, valued at $60,840,000.00, it looks like a very profitable investment, as it practically insures the cattle of the state against the spread of this dreaded malady, which in the course of time would ruin our live stock interests. The Federal Government and state authorities of Michigan have worked together in the most complete harmony in the eradication of this disease, and we feel almost certain now that we have it under complete control in our state. But the utmost vigilance is necessary for some time as a number of the nearby states are still afflicted with the plague. I feel satisfied that no measure for the safety of the live stock of the state will be overlooked by your honorable Commission, and each succeeding week impresses me with renewed confidence that your vigilence will be awarded by a clean bill of health for the entire state in the course of a few months at least.

In submitting this report, I wish to express my gratitude to the several members of the Commission for the courteous treatment I have received at their hands in the discharge of my duties under their direction and also to the veterinary profession throughout the state for the generous support they have afforded me in assisting in investigations in their localities.

I also wish to acknowledge my indebtedness to Dr. Ward Giltner of the Experiment Station, Agricultural College, and to our Pathologist, Dr. E. T. Hallman, for the able and efficient help they have rendered in every case where their assistance was solicited.

(Signed) Geo. W. Dunphy,
State Veterinarian.

JANUARY 1ST, 1917.

SIXTEENTH BIENNIAL REPORT

OF THE

STATE LIVE STOCK SANITARY COMMISSION

OF MICHIGAN

FOR THE

YEARS 1915 AND 1916.

A.D. MDCCCXXXV.

By AUTHORITY

LANSING, MICHIGAN
WYNKOOP HALLENBECK CRAWFORD CO., STATE PRINTERS
1917

STATE LIVE STOCK SANITARY COMMISSION OF MICHIGAN.

MEMBERS OF THE COMMISSION.

H. H. HALLADAY, President
W. R. HARPER, Secretary
MARTIN STAPLETON

STATE VETERINARIAN.

DR. GEORGE W. DUNPHY, V. S.

PATHOLOGIST.

E. T. HALLMAN, D. V. M.

Live Stock Sanitary Commission and State Veterinarian's Office in
Rooms 602 and 604 Prudden Block, Lansing, Mich.

Hon. Albert E. Sleeper, Governor of Michigan:

The State Live Stock Sanitary Commission has the honor to submit the following as its Sixteenth Biennial Report covering the years of 1915 and 1916:

We desire to call your attention to the fact that the value of live stock in Michigan reaches approximately the enormous sum of $200,000,000.00, and that this branch of agriculture has been developing most rapidly in the last two years. There has been an increased price in the value of all live stock during the two years just passed.

We also desire to call your attention to the fact that during this period more than 100,000 cattle and nearly 1,800,000 sheep have been brought into this state for fattening purposes, which after having been fattened have been turned back to Detroit, Buffalo and Chicago markets for slaughter. Herein lies one of the great dangers of getting infectious diseases among our native stock. When we consider that this live stock of commerce is constantly being shipped in cars which have not been cleaned and disinfected for some time, and which are being unloaded for feed, rest and water in many different stock yards, it proves the necessity for constant watchfulness on our part to keep diseases of a contagious or malignant character from gaining a foothold among our native stock,

It is the desire of this Department to encourage an increase in the production of live stock in this great state, and in doing so we realize that we must throw out every safe-guard to protect the health of all domestic animals in the state.

In the year 1915, there were shipped to the Detroit Stock Yards 84,547 cattle, 37,511 calves, 268,969 sheep, 539,217 hogs; in 1916, 136,645 cattle, 63,575 calves, 283,575 sheep, 650,176 hogs. This shows an increase of the year 1916 over the year 1915 as follows:

Cattle	52,096
Calves	26,064
Sheep	14,604
Hogs	120,959

During the year 1915, the shipments were somewhat reduced by the outbreak of Foot-and-Mouth Disease. However, this increase indicates that the Detroit Market is gaining in popularity, as the increased shipments will show. This does not include many shipments from Western markets direct to some of the large packing houses located in Detroit. We also wish to state that a large part of the live stock received in the Detroit Yards is raised and fattened on Michigan farms.

Detroit is the largest automobile center in the world; and if this increase continues in the live stock shipments to the Detroit Stock

Yards, may we not hope that in the near future that Detroit will be the principal marketing center for our live stock.

The expenditures of this Department have increased somewhat in the last ten years, partly by Legislative enactments and partly by increased demands made upon us by the public; but we assure you that the funds entrusted to us have been carefully and, we hope and believe, profitably expended. The expenses of our Department are drawn from the general fund, but we wish to suggest that the Budget System would be more satisfactory to us, as it would then indicate to what extent we should broaden our fields of activity.

The detailed report which follows we trust will give somewhat of an idea of the work of this Department during the past two years.

We desire closer co-operation in the future with all of the state departments where our work touches upon the problems which they are expected to handle; and we can see many ways wherein a closer relationship can be profitably secured in these matters.

Trusting our work and methods may meet with your approval at all times, and wishing to truly serve the people and an industry which deserves assistance, we respectfully submit the following report:

Financial report of the State Live Stock Sanitary Commission for year ending June 30, 1915:

Salaries of three Commissioners, State Veterinarian, and extra veterinarians	$8,574 40
Traveling expense	315 00
Rent	315 00
Postage	142 00
Printing and binding	298 75
Office Supplies and stationery	706 21
Express, freight and cartage	5 00
Telephone and telegraph	434 94
Automobile license for government car	3 00
Miscellaneous	77 83
Total	$15,917 61

Financial report of the State Live Stock Sanitary Commission for year ending June 30, 1916:

Salaries of three Commissioners and State Veterinarian	$5,993 94
Salaries of clerks and extra veterinarians	3,236 30
Traveling expense	4,927 34
Rent	300 00
Postage	165 00
Printing and binding	136 82
Office supplies and stationery	193 96
Express, freight and cartage	2 31
Telephone and telegraph	312 50
Disinfectants and spraying outfits	392 55
Total	$15,660 72

TUBERCULOSIS.

The control and eradication of Bovine Tuberculosis from the beef and dairy herds of Michigan has become one of the big problems confronting this Commission.

The people in various cities of the state have come to realize the danger to public health in allowing milk from dairy herds diseased with Bovine Tuberculosis to be sold for food purposes, especially where such milk is fed to children; consequently, many cities and villages of the state have enacted ordinances requiring all dairy herds supplying milk to such cities and villages to be tuberculin tested by a competent veterinarian once each year.

Whenever any reacting or tubercular cattle are found, they are reported to this Department and are appraised and slaughtered under the personal supervision of some member of this Commission as provided by law, unless placed in quarantine subject to the direction of this Department. This serves the two-fold purpose of protecting the public health of the people of the state and of eradicating tuberculosis from the various dairy herds which are producing milk for use in such cities and villages as have enacted proper milk ordinances.

Bovine tuberculosis has also become a serious economic problem which has become a menace to the pure-bred cattle breeding industry of the state of Michigan.

Our attention has been called during the past year to some very questionable pure-bred cattle transactions where careless or incompetent management of the tuberculin test has allowed cattle to be passed as healthy and sold to unsuspecting purchasers, that were afterwards found to be tuberculous.

It has been the policy of this Department in the past, and will continue to be our policy in the future, to prevent unfortunate occurrences of this kind; and if it should develop on investigation that the parties to these transactions were aware of these conditions, we will endeavor to see that they are punished under the laws of the state.

We feel that we have the united support of all reputable breeders of pure-bred cattle in the state, and it is the express wish of these breeders that this Department give personal supervision to many of the leading pure-bred herds of cattle in an effort to completely eradicate Bovine Tuberculosis from such herds.

To this end, we have been asked to work out some system for establishing state accredited herds, where the owners of pure-bred cattle may voluntarily place their herds under the direct supervision of this Department for regular and systematic tuberculin testing by competent veterinarians employed or selected by this Department, as it is thought that this move would eliminate much of the danger to the cattle breeding industry of Michigan resulting from carelessness and incompetency in the application of the tuberculin test.

A third factor in this problem of Bovine Tuberculosis to which our attention has been called is the extent to which hogs are subject to the ravages of this disease. We are informed by the management of the larger Detroit packing houses, where government meat inspection is maintained, that their losses due to hogs being condemned upon being found affected with tuberculosis are considerable each year. Hogs contract tuberculosis through following after beef or dairy cattle which are diseased with tuberculosis, or through drinking skimmed milk which has been produced by tuberculous cows. Thus the control and eradication of tuberculosis in cattle becomes an economic factor in the hog growing industry of the state, and is one of the many causes contributing to the high cost of the hog meat products.

We feel that we have met with considerable success during the years of 1915 and 1916 in eradicating tuberculosis from many of the herds of cattle in this state; and while we have accomplished much in the past, we realize that there is much to be done in the future if we are to maintain the present low percentage of tubercular cattle in Michigan. The records compiled at our office would indicate that during the years of 1915 and 1916, 2,559 herds containing 27,253 head of cattle were tested, and only 1,712 cattle were found tubercular and slaughtered, which would only be a little over 6% of the cattle tested. These figures would not indicate the general percentage of cattle which are diseased with tuberculosis in this state at the present time, as many of the herds that we tested were herds in which we knew or suspected that tuberculosis existed, and would not give a fair index of the condition of the cattle of the state in a general way. However, even those figures have convinced us that tuberculosis is not present in the general herds of cattle in the state to any alarming extent, and we believe that care and watchfulness on the part of the Commission, and the co-operation of the cattle owners of the state, will reduce its percentage to a very much lower rate or eradicate it almost entirely. This Department believes that the next two years will show a great diminution of the percentage of tuberculosis throughout this state.

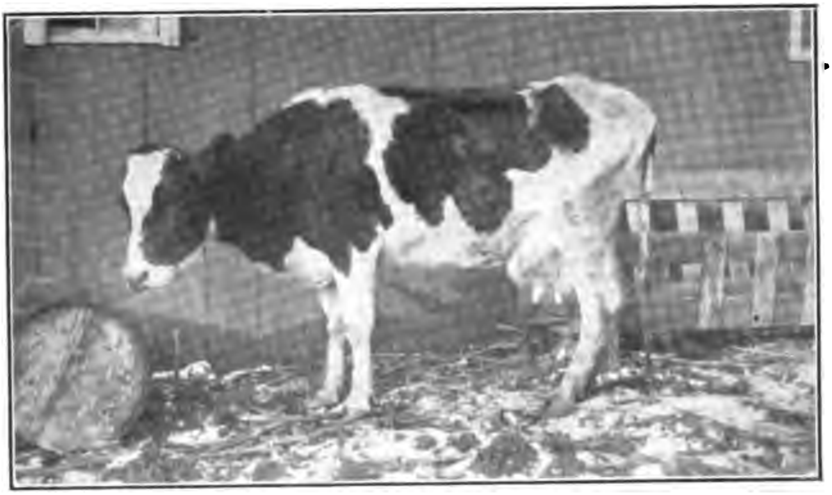
A tabulated list of the number of tubercular cattle slaughtered, together with the amount of money paid by the state, follows:

1915.—Number of cattle slaughtered for tuberculosis from January 1, 1915, to December 31, 1916, by counties, showing the total amount of money paid by the state:

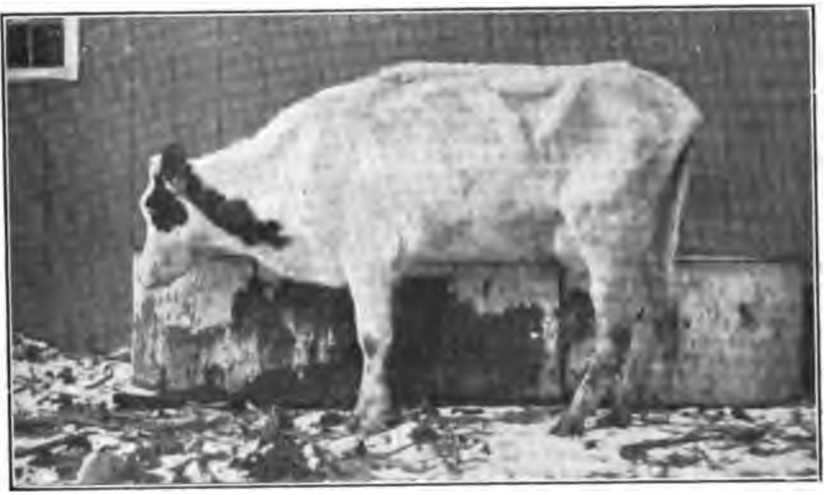
Counties.	Number of animals.	Amount paid by state.
Allegan	89	$2,769 00
Alpena	26	645 00
Barry	3	75 00
Berrien	4	125 00
Branch	6	150 00
Calhoun	10	487 50
Dickinson	3	130 00
Genesee	10	325 00
Gladwin	1	50 00
Gratiot	2	50 00
Hillsdale	3	75 00
Houghton	3	150 00
Huron	1	25 00
Ingham	5	250 00
Ionia	5	125 00
Jackson	72	2,335 00
Kalamazoo	6	150 00
Kent	177	5,652 50
Lenawee	4	125 00
Livingston	4	150 00
Macomb	18	450 00
Marquette	13	350 00
Menominee	28	690 00
Monroe	1	50 00
Montcalm	1	50 00
Muskegon	19	500 00
Newaygo	1	50 00
Oakland	29	750 00
Oceana	8	325 00
Osceola	1	50 00
Ontonagon	33	1,325 00
Ottawa	104	2,660 00
Schoolcraft	1	25 00
Shiawassee	5	125 00
St. Clair	9	225 00
Tuscola	2	62 50
Van Buren	9	400 00
Wayne	60	1,812 50
Total	776	$23,744 00

1916.—Number of cattle slaughtered for tuberculosis from January 1, 1916, to December 31, 1916, by counties, showing the total amount of money paid by the state:

Counties.	Number of animals.	Amount paid by state.
Allegan	103	$3,340 00
Barry	2	75 00
Berrien	5	175 00
Bay	7	250 00
Branch	10	275 00
Calhoun	38	1,775 00
Clare	1	25 00
Clinton	5	250 00
Dickinson	5	250 00
Eaton	1	50 00
Gogebic	20	475 00
Genesee	7	175 00
Gratiot	22	570 00
Hillsdale	3	150 00
Houghton	8	200 00
Ingham	2	100 00
Ionia	23	575 00
Jackson	29	762 50
Kalamazoo	2	70 00
Kent	93	3,002 50
Lenawee	44	2,200 00
Livingston	28	975 00
Macomb	42	1,100 00
Marquette	26	650 00
Mecosta	2	75 00
Monroe	17	850 00
Menominee	3	100 00
Montcalm	5	250 00
Muskegon	7	200 00
Newaygo	11	267 50
Oceana	9	225 00
Ontonagon	4	100 00
Ottawa	133	3,645 00
Oakland	133	4,330 00
Ogemaw	23	1,125 00
Saginaw	2	100 00
Sanilac	20	600 00
Shiawassee	1	25 00
St. Clair	17	425 00
St. Joseph	5	125 00
Tuscola	2	75 00
Van Buren	5	125 00
Washtenaw	4	200 00
Wayne	7	250 00
Total	936	$30,562 50



11-year-old cow in the last stages of tuberculosis.



3-year-old cow in the last stages of tuberculosis.

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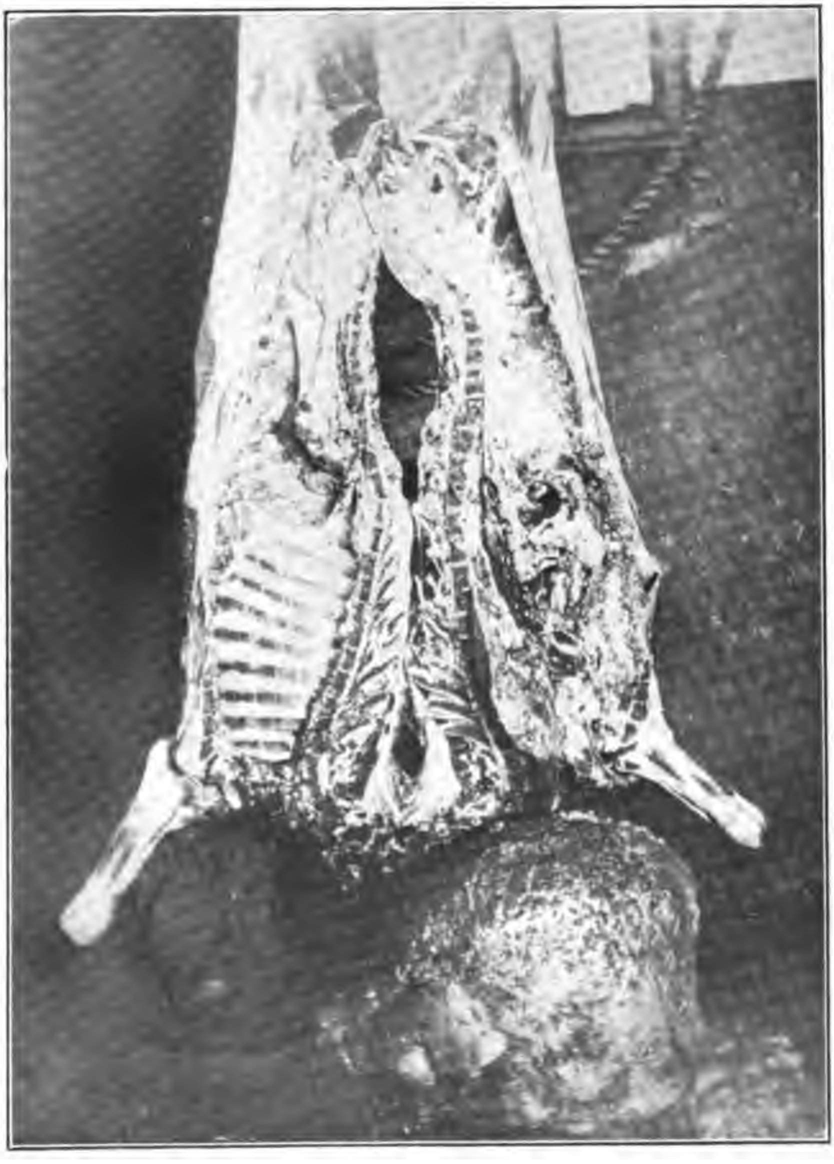


Carcass of three-year-old animal badly affected with tuberculosis.

UNIV.

HOG CHOLERA.

During the time covered by this report, special efforts have been put forth by this Commission and its co-operative agencies in the control of hog cholera within the state. The enormous and ever increasing annual losses from this disease necessitated that some systematic measures of control be undertaken. For the purpose of working out an efficient and practical method of controlling cholera, a co-operative experiment, which was referred to in the Fifteenth Biennial Report of this Commission, was inaugurated in Branch county by this Commission, in co-operation with the Bureau of Animal Industry, United States Department of Agriculture, Michigan Agricultural College, and Branch County Farm Bureau, in 1914, and continued during the succeeding two years. By this experiment, it was demonstrated that by properly educating the farmers regarding the nature of cholera, the ways by which it is spread, and the best methods of combatting it, together with the prompt administration of anti-hog-cholera serum to the well hogs in infected herds, and strict enforcement of quarantine and sanitary measures on infected premises, effective control of cholera could be accomplished and the losses reduced to a minimum. The following table shows the number of hogs lost during the year preceding the inauguration of this experiment, and results compiled at the end of each year's work during the life of the experiment:

1913.

Hogs raised in the county	55,338
Number of outbreaks	308
Number of hogs lost	4,039

1914.

Number of hogs raised	57,878
Number of outbreaks	90
Number of hogs lost	667

1915.

Number of hogs raised	60,000
Number of outbreaks	19
Number of hogs lost	210

1916.

Number of hogs raised	60,000
Number of outbreaks	1
Number of hogs lost	1

By observing the above figures, it will be noted that during the entire time the experiment was in progress, cholera was kept well under control, and upon the completion of the experiment that cholera had been practically eradicated from the county.

Previous to the time covered by this report, the control of cholera had been carried on under the laws of the state pertaining to the general control of animal diseases; but experience had demonstrated the desirability of more specific legislation pertaining to this subject. A conference with certain interested members of the 1915 Legislature was called by the president of this Commission for the purpose of discussing this problem and formulating a bill, under the provisions of which cholera could be more effectively controlled within the state. This conference drafted a bill which was presented to the Legislature and passed by both branches without a dissenting vote. One of the provisions of major importance contained in this statute is that which provides for the appointment of county live stock sanitary agents in each county in the state where county agricultural agents are not employed and where cholera is, to any marked degree, an important consideration. These appointees are charged with, and are responsible for, the direct local supervision of hog cholera control work in their respective counties; and while being compensated for their services and reimbursed for their necessary expenses from the county funds, are under the direct guidance and supervision of this Commission, and are expected to report directly to the Commission and to submit an annual detailed report to their local boards of supervisors.

Another important provision of this statute is that relating to the use of anti-hog-cholera serum and virus. Under the provision of this statute, no serum other than that manufactured and tested under Federal supervision, or produced by the State Agricultural College or State Experiment Station, is permitted to be used within the state. The use of hog-cholera virus is restricted to persons designated by this Commission or the State Veterinarian as competent and skilled in its administration. In the past, considerable unsatisfactory results have followed the use of anti-hog-cholera serum and virus, apparently traceable to unreliable serum or inefficient administration of virus. The restriction imposed by this statute practically guarantees potent and reliable serum for use within the state, and restricts the use of virus to those veterinarians who are considered competent by this Commission, and the State Veterinarian.

The disposition of cholera-infected herds by shipment to an establishment where Federal, State, or Municipal inspection is maintained is provided by this law. Such disposition must be under the supervision of the local live stock agent or other representative of this Commission, and must be subject to restrictions and regulations promulgated by the Commission. A thorough cleaning and disinfecting of premises must immediately follow the disposal of the infected herd. The application of this provision, in a large number of outbreaks during the past two years, demonstrates that it is a sane and practical method of handling certain outbreaks. The owner is not only enabled to realize more or less salvage from the herd, but the foci of infection is removed from the community, thus limiting the danger of spread to neighboring herds. It is quite probable that many epidemics have been avoided, in as many communities, during the last two years by the disposal of initial outbreaks in this manner. This law was put into immediate effect and during the year 1915 and 1916 thirty-four agents, in as many counties have been appointed, and are actively engaged in control work. While no accurate statistics in regard to the losses from cholera during the year 1915 are available, yet it is well known that, taking the state as a whole, a large reduction in losses over the immediately preceding years was brought about. These results, in view of the recent enactment and application of the law, were especially encouraging.

After carefully observing the second year's work under this law, it is the opinion of the Commission that the general plan and provisions of the law are workable and practicable, and provide an efficient means for combatting cholera within the state. By the system of maintaining local representatives in each county, the Commission is enabled to be kept in touch with conditions in the various counties at all times, and ideal opportunities for efficient co-operative work between this Commission and the Bureau of Animal Industry through these representatives are presented.

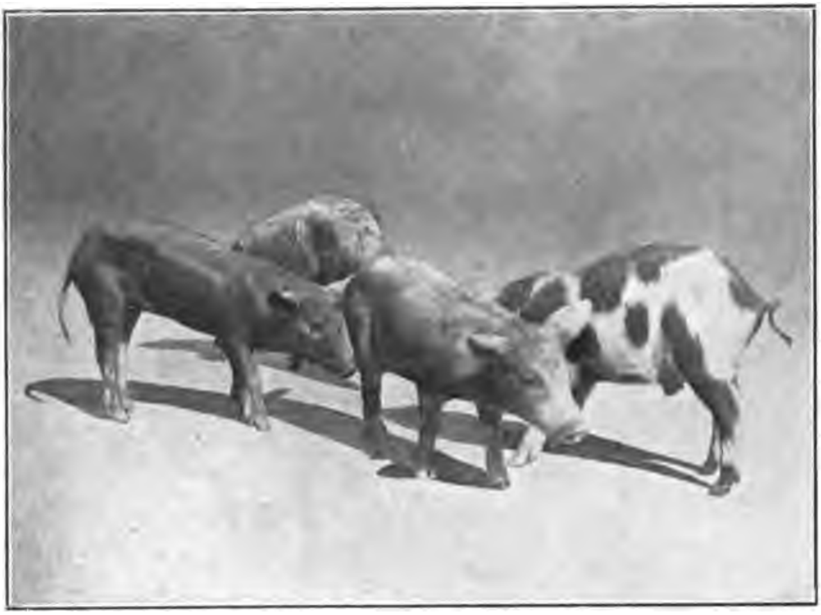
After the completion of the Branch county experiment, this Commission was successful in bringing about the assignment of the Bureau force, located in that county, to state-wide control work, in co-operation with the Commission. Under this co-operative plan, three veterinarians, employees of the Bureau of Animal Industry, are located in the state with headquarters at Lansing, Kalamazoo, and Adrian. The duties of these men are to instruct the farmers relative to the general subject of cholera and its prevention; to work with and assist county live stock agents, local veterinarians, and others who may be interested in cholera-control work; in making diagnosis; demonstrating the application of the various methods of serum preventive treatment; and to advise regarding quarantine and sanitary measures. The entire time of these men is devoted to this work, and their large experience in the control of cholera is a valuable asset to the work. During the winter season when cholera is less prevalent, these men in conjunction with the State Veterinarian are devoting their time largely to the organization of veterinarians in the different counties; or where so few veterinarians are located in a single county as to make the success of a county organization questionable, into district associations. The object of these county or district associations is especially for the purpose of interesting and enlisting the support of the local veterinarians in the work of hog-cholera control, and of establishing an harmonious co-operation between the local veterinarians and the local live stock agent. It is expected that all counties or districts, wherein cholera is an important consideration, will be organized during the present winter.

The matter of having potent and reliable anti-hog-cholera serum which would be readily available to farmers at the lowest possible cost was taken up by this Commission. Correspondence with numerous commercial serum producers was exchanged, which resulted in serum being made available at a price greatly reduced from that of previous years, and considerable lower than the general retail price over the country during the last year.

The disinfection of infected premises, after an outbreak of cholera has abated, by live stock sanitary agents has been insisted upon. Apparatus and disinfectants are furnished free by the Commission to these agents, who in turn apply the disinfectant to the infected premises without cost to the owner. During the two years thirty-five disinfecting pumps and about two hundred fifty gallons of disinfecting material were supplied by the Commission for this purpose.

The work in connection with the control of cholera during the coming year will be along those lines followed during the previous year. The success attending the last year's work greatly exceeded our expectations; and while cholera was widely disseminated throughout the state last year, as will be noted by observing the table of statistics taken by counties, in but few localities was it allowed to assume the proportions of an epidemic, and in practically every case where epidemics did exist, it was due to a lack of co-operation on the part of the farmers, due probably to a lack of a clear understanding of the purposes and objects of the work. There is need of further educational work among farmers throughout the state in order that they may become familiar with those preventive methods which are most effective against cholera, thus being enabled to protect their own herds in a most efficient way, and in case cholera reaches a farmer's herd that he may be able to avoid the greatest possible loss and be willing to make individual sacrifices for the benefit of the community.

Farmers should be made to understand that their support and co-operation is vitally important in the control of cholera, and that without such co-operation, state and Federal officials will be able to accomplish but little in the control of the disease.



Pigs affected with hog cholera.

Report of Hog Cholera Control work conducted in Michigan during year 1916, by the U. S. Department of Agriculture, Bureau of Animal Industry, Michigan State Live Stock Sanitary Commission and county live stock agents:

Counties.	Number of hogs raised in state during year.	Number of outbreaks of cholera during year.	Number of hogs lost during year.	Number of herds treated with serum alone.	Number of hogs treated with serum alone.	Number of herds treated with simultaneous inoculation.	Number of hogs treated with simultaneous inoculation.	Number of farms quarantined.	Number of farms disinfected.	Number of outbreaks existing in December 31, 1916.
Jackson	55,000	42	234	62	912			56	42	3
Monroe	40,000	15	40							1
Kalamazoo	50,000	12	165	17	171			14	14	
Hillsdale	30,000	3	14	3	18			3	3	
Barry	55,000	4	27	4	105	1	16	4	13	
Calhoun	30,000	25	211	27	299	3	60	26	24	2
Ottawa	3,000	5	7	5	48				5	
Saginaw	27,000	9	38	5	34			9	9	1
Lapeer	25,000	1	4	1	12			1	1	
Cass	50,000	17	98	14	296	1	8	17	14	
Kent	40,000	5	30	5	100			4	5	
Van Buren	20,000	8	46	4	91			8	6	1
Clinton	55,000	19	200	4	25	1	9	20		1
Berrien	40,000	12	80	20	200	10	75	10	6	
Livingston	32,000	10	102	10	190			8	8	1
Oakland	20,000	10	224	6	60	2	110	7	7	
Lenawee	50,100	49	440	40	500	19	233	49	38	
Shiawassee	50,000	37	440	34	620			41	31	6
Macomb	15,406	1	1						3	1
Branch	60,000	1	1	1	10			1	1	
Genesee	32,000	10	155	12	199	1	10	10	3	
Ionia	30,000	10	200	3	70			10	9	
Ontonagon	1,000									
Marquette	1,000	3	100	2	85			2	2	1
Schoolcraft	800	1	12	1	20			1	1	
Iron	500									
Huron	20,000	9	20	6	85	3	30	9	9	
Gratiot	50,000									
St. Clair	16,000	2	19	4	20			6	6	
Sanilac	3,000	2	3			2	40	2	2	
Gogebic	2,500									
Alpena	2,400	2	6	1	7			2	2	
Newaygo	20,000									
Mason	10,000									
Manistee	4,500									
Muskegon	6,000									
St. Joseph	50,000	12	160	13	187			11	8	1
Washtenaw	30,000									
Wayne	24,000	6	25	4	40	1	7	3	6	
Total	1,051,106	342	3,062	308	4,404	44	598	334	278	19

Hon. H. H. Halladay, President, Michigan Live Stock Sanitary Commission:

Dear Sir:—In submitting the Sixteenth Biennial Report of the State Veterinarian to your Honorable Commission, I take great pleasure in being able to report the fact that during the two years which have passed since my last report, the state has been free from any such severe and expensive ravages as the Foot-and Mouth Disease outbreak of 1914.

The usual contagious diseases that invariably prevail in all live stock breeding centers has engaged our attention to a considerable extent, but as near as I can learn from the study of the statistics of the various states, our live stock is in as good, if not better, condition than in any other of our sister states in this great country. We have made great progress in the control of hog cholera, and I feel satisfied that the coming year will show that the work done in the last two years has had a tendency to lessen the ravages of tuberculosis.

The repeated testing of our state herds and the efficient work done among the pure-bred cattle of many of our breeders has not only reduced the percentage of tuberculosis, but with the instructions given to owners of live stock in regard to ventilation of barns, sanitation and disinfection, have reduced the percentage of tuberculosis to a very great extent; and in a great majority of cases has fully demonstrated that herds quite seriously affected with the disease may be cleaned and kept clean by giving them proper attention.

The control and eradication of this disease, although somewhat expensive to the state, is of very vital importance owing to the fact that tuberculosis of the bovine type is communicable to mankind through the medium of meat and milk (especially to children who are living on a milk diet). We are aiding greatly in the war that is waged at present not only in this state, but throughout the whole country for the control and ultimate eradication of tuberculosis among the human race. In the opinion of the writer, no more laudible work can be carried on in our live stock problems, looking at it from the standpoint of humanity as well as the economical side.

As the history and statistics of the work with tuberculosis will appear in the report of the Commission, I will not give any further attention to this disease, but will call your attention to other diseases of cattle that come under my observation, and consideration, in the work that I have been engaged in under the direction of the Commission.

CONTAGIOUS ABORTION.

This disease (so named before its true etiology and the wide dissemination of the micro-organism that is believed to be the cause of abortion in the lower animals) has reached a point where it may be considered the greatest menace to the dairy and breeding interests that we have to contend with at the present time. Much time, and earnest endeavor, has been given to a study of the disease and methods for its control, but at the present writing, no satisfactory solution of the problem has been reached.

I shall attempt to give a brief summary of this subject from a practical standpoint, as the matter will be taken up in detail in the report of the Pathologist. However, as the scientific part of the work is still in the experimental stages, I will endeavor to give some methods of procedure which, if carefully carried out, will have a tendency to at least hold the disease in check and reduce the losses to a minimum. It is impossible to determine when this disease first reached this continent. We know, from the history of animal diseases in the past, that this disease existed both in Europe and the United States long before it was recognized or even suspected of being a contagious or infectious disease.

Prof. Bang of Copenhagen was the first to discover its specific cause in 1897. However, it was not until within the last few years that the extreme seriousness of the disease began to attract the attention of the veterinary profession or live stock breeders of this continent. Soon after Prof. Bang's discovery of the microorganism that he claimed was responsible for the disease, some of our breeders began to feel a certain amount of apprehension about their herds, as abortions were taking place, especially among their cows, which had at first been attributed to accidents, but were increasing in frequency and often occurring where it seemed impossible to trace to accidental origin; consequently, when it became known that a disease of this kind had been proven to be infectious in its nature, live stock men began to look around for a remedy. Strange to say, instead of availing themselves of a method of control offered by Prof Bang (who first discovered the nature of the disease), they began chasing, as it were, after strange gods, and generally adopted some empirical remedy designed principally to part the fool from his money.

Owing to the vagaries of this disease, it was an easy matter for the faker to work his quack nostrum, as many cows that have aborted once may become consistent breeders afterwards, and no matter how simple the remedy it always gets the credit for every fortunate accident, while if it proves a failure they make up their minds that it was a hopeless case and go on with the so-called remedy until the usefulness of the herd, if not destroyed, is very much impaired.

This is one of the cases where the live stock breeders need the help and advice of the skilled practitioner. In case of an abortion, the uterus of the cow should be freely douched with a mild disinfectant, using large quantities of warm water with some non-irritant antiseptic. The external parts of the cow, such as the vulva, tail, hind quarters, and udder should be washed in a fairly strong solution of some disinfectant, and the floor of the stable thoroughly disinfected. If the afterbirth is retained, which is frequently the case, the douch should be used twice per day until it comes away of its own accord, or can be carefully removed under antiseptic conditions. This is where the skill of the educated veterinarian is essential, as the Oss Uterus should not be allowed to close until the placenta is removed; and great care exercised to prevent infection.

In all cases, the aborting animal should be immediately removed from the herd and kept isolated while there is any discharge from the womb. The skilled practitioner will understand the necessity of using non-poisonous and non-irritant disinfectants in douching the womb, as a fluid having a caustic tendency would harden the membrane where it attaches to the cotyledon, and make it adhere more firmly; while on the other hand, if kept moist, it gradually relaxes its hold and comes away easily. There will be exceptions to this rule, as there are to all rules, but this method is the best we have ever found and will be well to hold onto until a better one is worked out, which we have every reason to believe will be accomplished in time, as every live stock producing country has a large number of scientific men at work on this problem. Three things are essentially necessary to bear in mind in the handling of this disease: viz., segregation, cleanliness, and disinfection.

Another important feature to consider in relation to this disease is the fact that it appears that animals become immune, after one or more abortions, in many instances; but may still be carriers of the disease, so much so that new females being brought into the herd from time to time will keep the disease in existence on the premises, as each susceptible animal will furnish a new subject for the disease.

The experience of a number of reliable practitioners led to the conclusion that aborting cows frequently acquire immunity after the first abortion, and if carefully treated usually become useful and consistent breeders; while others may abort the second time before immunity is established. Consequently, if proper care and attention is given the herd, its usefulness may be preserved in a great measure. However, this can only be accomplished by skill and perseverance, as rough handling or improper treatment of the affected parts will be apt to end in disaster and discouragement. The rapid development of the demand for dairy products, their advance in price, and the necessity of keeping our milk and meat supply on a par with our increasing population should warrant our live stock breeders and dairymen in entailing considerable expense in an endeavor to preserve a breeding herd.

While it is not the duty of the State Veterinarian to treat diseases, with the permission of your Honorable Commission, I am always ready and willing to assist the practicing veterinarian in every way possible in the control of this disease, advising them at all times and offering suggestions that may be of value, in order to render all possible benefit to the live stock interests of the state.

HEMORRHAGIC SEPTICAEMIA.

This may be defined to be an acute infectious disease characterized by intense febrile symptoms often accompanied by manifestations of an acute Gastro Enteritis, and frequently a necrotic Pneumonia associated with more or less edema of the Alveolar connective tissue, and often an inflammatory edema of the skin on different parts of the body.

The disease appears to occur sporadically in this state in the summer months, usually among cattle in new or untilled land, and is so sudden in its appearance and fatal termination that the attention of the stock owner is first attracted by the finding of one or more animals dead in the pasture. The disease is caused by the bacillus Bi-polaris bovisepticus, of which there are several varieties.

This is a short non-motile bacillus, does not form spores, is aerobic, and can be grown on several kinds of media, such as agar, boullion, and gelatine. It stains readily at the end, but only slightly in the middle. In order to isolate the bacilli, it is necessary to get them from a recent case of an acute character, as the organism is not very numerous in chronic cases, and seems to perish quickly after the death of its victim. This organism seems to be widely spread, and is said to produce disease in almost any of the domestic animals. They seem to exist as sprophytes in the soils in certain districts, and under ordinary conditions do not manifest pathogenic characteristics.

Under certain conditions, as yet undefined, they assume a virulent character and attack the tissues of the healthy body; while, on the other hand, they have been found in the digestive tract and in the air passage in an apparently harmless condition. It may be that the resistance of the defensive forces in the animal holds the organism in check unless the resistance is weakened by anaemia, catarrh, starvation or fatigue from over exercise, or a scratch or abrasion which may allow the entrance of the bacteria into the lymph vessels.

The virulence of the 'contagion varies very much in different outbreaks. We find, in some cases, the animal may have every appearance of perfect health in the evening, and be found dead in the morning with the post mortem showing well-marked lesions of the disease. In these acute cases, we find a very markd hyperemia of the internal organs, with ejtensive hemorrhages of the serous and mucous membranes, as well as in the lungs, and also the muscles in many instances. In other cases, we have an edematous form in which the subcutaneous connective tissue of the neck and throat region show a gelatinous infiltration and occasionally show hemmorhagic spots.

This form of the disease seems to assume a sub-acute character and runs its course slowly, sometimes lingering for several days, but invariably proving fatal. The post mortem appearance of these cases is important, as they are the only means we have of diagnosis in the majority of instances, as the disease is usually terminated fatally before there is a chance for observation.

The abdominal cavity frequently contains a large amount of yellowish serous fluid, or this fluid may be of a light reddish color. The small intestines frequently have the appearance of an acute enteritis or intense hemorrhagic inflammation. The contents are usually very thin fluid, and mixed with blood. In other cases, we may have only the pectoral form, with all the abnormal conditions showing in the thoracic cavity, which may be filled with serofibrinous exudate, sometimes mixed with blood. The pleura is generally studded with small hemmorhages, and the vixceral layer may be covered with a fibrinous membrane. The lungs may show large hemmorhagic areas, or complete red hepatization, and in some instances small dry caseous areas are found. In cases where the whole lung is not completely hepatized, the free parts show a hyperemic condition with well-marked edemia. The pericardium often contains an exudate of serofibrinous material of a yellowish color. The bronchial and mediastinal lymph glands are swollen and congested, and show the hemmorhagic condition peculiar to other adjacent organs.

These post mortem lesions are very important, as in the majority of cases, they are the only guide we have in regard to the nature of the disease, as we seldom reach the place where th malady exists until death has claimed the first of the victims; and those that acquire the disease from a later infection seem to have a more sub-acute form accompanied with swellings of the throat, neck and dewlap. These swellings are due to inflammatory edemia of the connective tissue under the skin. Swellings also occasionally appear in the head, and often in the legs. The pectoral form of the disease in its early stages is characterized by symptoms of an acute pleuro-pneumonia accompanied with a dry and painful cough and a serous discharge from the nostrils, sometimes streaked with blood; respiration its very labored and a very marked dullness on precussion along the thoracic region. Rumination is suspended and peristalsis of the rumen and intestinal tract is usually suppressed at first, but the short period of constipation is followed by a diarrhea, in which the thin liquid feces is streaked with blood, and death generally ensues in a short time.

Another more frequently occurring form of the disease that I have noticed in this state is a chronic form that we find in animals which have passed through the stock yards at some of the great shipping centers. This form of the disease is generally ushered in with catarrhal symptoms, such as a dry husky cough, stareing coat, and great lassitude. The eyes become inflamed, and frequently affected with an acute conjunctivitis accompanied by a watery discharge from the eyes, very profuse, the tears running down the side of the face. Percussion over the lung cavity gives a very dull sound, and rales can be heard on osculation. Recovery takes place in a few of these animals, but they are usually emaciated and have a persistent cough and an unthrifty appearance for a considerable time.

Treatment of the affected animals has not proved satisfactory, and can at best be only of a stimulant and antiseptic nature. However, experiments are being conducted by the Bureau of Animal Industry, with a view of producing an immunizing serum, that is showing every encouraging results. I must say that my experience with this serum, although limited, has made me very optimistic in regard to its value in the treatment of this disease.

Owing to the fact that the disease has its origin in the soil, quarantine as a preventive measure is of little value, except in cattle coming from infected stock yards which should not be allowed to mingle or associate with native cattle until certain that the period of incubation is passed. In case of a sporadic outbreak, it would be wise to remove the sick animals immediately from the rest of the herd and change the invironment, if in pasture; and if in the stable, the sick animals should be removed and the stables disinfected at once.

A noticeable feature of this disease is that it seldom affects more than from twenty-five to forty per cent of the herd. This is attributed to the fact that the virulence of the organism seems to be reduced in its passage through the animal, and appears to be attenuated to such a degree that it only produces slight, if any, effect on the healthy animal.

Sheep appear to be susceptible in about the same degree as cattle, and the disease runs about the same course in these animals; consequently, the same precautions should be taken to see that those that are sick are separated from the remainder of the flock, and if in pasture, it would be wise to place them on higher and cultivated land.

RABIES.

Rabies or Canine Madness, is an acute contagious and, almost without exception, fatal infectious disease, characterized by disturbed consciousness, increased nerve irritibility, and later by symptoms of paralysis. The disease is usually transmitted by the bite of an infected animal to other animals, as well as man. The infectious virus is believed to be a filterable micro-organism. It is one of the oldest diseases that we have any record of, having been well known since the time of Aristotle; and for hundreds of years, it was believed to be spontaneously developed. There were many attributable causes of the disease, such as extremely hot weather, lack of drinking water, unsatisfied sexual desire, and violent nervous excitement; but all these attributable causes are now set aside and the fact is well established that rabies can only be produced by the transmission of the virus in some form into a susceptible animal. The disease occurs in all parts of the world among dogs, cats, and carnivorous wild animals, especially wolves and foxes. Scientific investigation and experience have clearly demonstrated that it is an acute, specific disease, that it is due to a specific cause and living organism, and can be transmitted by inoculation only. The process, when it is accomplished, is produced, almost without exception, by an animal which is suffering with the disease conveying to the wound inflicted by its teeth, either on another animal or upon man, the saliva which contains the virus. It is possible that the virus may be conveyed to the wound of man or beast without the subject being bitten, as the virus has been found to exist in the salivary glands or saliva, the mammary glands, milk or pancreas, lachrymal glands, and supra-renals. Consequently, it is of the utmost importance that the public should be warned of the danger of handling animals supposed to have died of rabies, if they have any wounds or slight abrasion of the skin that might come in contact with the saliva.

SYMPTOMS.

The symptoms of rabies vary very much in different subjects in the same species of animals. In the initial stage of the disease, the animal shows a peculiar change in behavior, which appearing in house dogs is so inconspicuous that it is completely overlooked, and the owners associate with them as usual without suspecting anything. Most dogs become capricious, they are at times irritable and gloomy, avoid all noise, and obey the call of their master very unwillingly, but immediately upon approaching him will jump about and fawn on him even more markedly than usual. In other cases, they show a remarkable uneasiness and a great deal of nervousness, frequently change their place of rest, and walk uneasily around in the yard or in the room, sometimes stopping suddenly and listening with all attention and without any cause, barking and sometimes biting at the air. The reflex excitability is in this stage decidedly increased. This is shown by the fact that the animals, when approached in a friendly way, and still more when teased, become excited and snap at the caressing hand, or any other objects that they come in contact with.

This excitability is particularly conspicuous toward strange persons and dogs, even when they are still friendly. The reflex excitability gradually becomes more noticeable as the patient will often start or jump up frightenend on the slightest external cause, such as a strong light or a sudden noise or the touching of his body. In this stage, we will often notice a peculiar breathing due to a spasm of the diaphragm while excited, and close examination will show great dilation of the pupils. At the same time, a peculiar change of appetite or taste is observed, as the animal scarcely touches his usual food or lets it drop again after having it in the mouth. Later, they reject all food, although they will chew all objects within their reach. In the next state, which develops in from one to two days, the described symptoms attain a higher degree, and the unrest and excitement sometimes increase to a violent rage. In many cases, they will be observed to lick the earth furiously and chew any objects they find, tear them to pieces and swallow them eagerly. When this condition takes place, they become violent by turns, and if not securely confined will break out and run away from home. On these journeys, dogs act strangely, aimlessly venturing into places where they would not ordinarily go. They often move very rapidly, traveling over a considerable space and returning home in a very tired and dilapidated condition. They exhibit, during these excited periods, a tendency to bite lifeless objects, other animals, persons, or even snap at themselves. In these cases, the dog is unable to bark normally, but gives vent to a peculiar howl which is almost sure to attract the attention even of one who has never before heard it.

In the third, or paralytic stage, the prominent features are the dropping of the lower jaw, the lolling out of the tongue, saliva hanging from the mouth; inability to swallow, drooping of eyelids, and a general wearied appearance. Death usually comes within a few days after the paralytic stage sets in.

What is known as dumb rabies is distinguished from the furious form by the predominance of the paralytic stage owing to the complete absence of the first two stages. There is no essential difference, except in the degree of nervousness, between the two types, for the same kind of virus may produce one as well as the other form. Pasteur was of the opinion that the furious form occurred when the virus acted principally upon the brain, and the dumb rabies when it was concentrated in the spinal cord; but no authentic proof is given of this theory.

In the horse, we invariably get the furious form of rabies. The animals knaw at the sight of the bite on the body or rub it against objects, where the virus is absorbed. This behavior in otherwise quiet horses, particularly if they have been bitten by a dog several weeks previously, arouses a reasonable suspicion of an attack of rabies. The horse at first appears to show signs of fright and unrest, which appear on the slightest provocation. They change their position frequently, paw with the front feet, gnaw at the manger and other objects near them, and show staring restless eyes with the pupils very much dilated, and very often bite at their own body, especially about the breast and fore arm. In many cases, they will show aggressive behavior toward other horses or human beings, and still more toward dogs, which they will attempt to bite and kick. A horse in this condition will almost wear himself out, and perhaps tear the manger down before the paralytic symptoms set in.

Cattle also show unrest and excitement, as well as an aggressive tendency, which in a quiet animal at once attracts the attention of the attendant. In these cases, the animals remain standing at one place, tear up the earth with feet and horns, looking around with the head high, eyes wild and staring, and finally furiously attack the other animals of the herd, and will often attack human beings, and are particularly aggressive to dogs if one happens to come near. Animals tied in the stable attempt to get loose from the chains, will jump up suddenly from their resting place, shake the head, bite at and climb into the manger, and sometimes run the head against the wall with enough force to break the horns.

In other cases, the symptoms of irritation are only slightly marked or entirely absent, but there appears instead an early weakness of the hind extremities and a marked downward curving of the spine, accompanied by mild bloating, difficulty in swallowing, and constipation. In walknig or in raising the head, animals may fall down readily and then kick with the feet. They breathe very hard and discharge foamy saliva from the mouth, and sometimes emit a painful bellow, move with a stiff gait, will smell at the hay and drinking water but consume nothing. This condition, as in the horse, is usually followed by paralysis, and death generally results about the second day after the paralytic symptoms set in.

In swine, the affection begins nearly always with very decided symptoms of irritation. The animals run around in all directions, grunt hoarsely, root the litter and the earth, gnaw and rub at the sight of the wound, and then hide under litter or lie close to the ground and remain quiet for a while, and will usually grunt while lying down. If they are aroused by a noise or when touched, they jump up and run aimlessly around, attacking other swine or grabbing any object that come in their way, occasionally taking hold of litter or anything that comes within their reach and shaking it like a dog. Symptoms in the hog are not very different from those in the dog, as the furious symptoms soon give way to paralysis, and the animal generally dies from the second to the fourth day of the disease.

In the man the first symptoms are generally sleeplessness, and the attack is ushered in frequently by difficulty in swallowing liquids, which is due to spasm of the muscles of the pharynx. These spasms soon extend so as to involve the muscles of the neck, and later those of the body and limbs. An attempt at swallowing at this stage is sufficient to bring on a violent attack of general convulsions. Those who have witnessed this form of the disease in man have characterized it as being of the most terrible nature and the suffering of the patient as being beyond description.

PERIOD OF INCUBATION.

There is no fixed period of incubation in Rabies. Such eminent authorities as Pasteur, Hartwick, and Prof. Ray (of the Veterinary School of Lyons, France), say it varies from thirteen days to twenty-four months. Pasteur says these variations depend not upon the virulence of the virus, but upon the amount absorbed. However, each individual has fixed the time by his own actual experience, which has shown a marked degree of variation. Sir Thomas Watson of London, England, fixed the incubation period in man from six weeks to three months, although he admits that it may be a much longer period. He reports a case where six dogs were bitten at the same time. The first one went mad in twenty-three days and the last of the six in one hundred eighty-three days. In my opinion, Dr. Abbey has given us the most sound advice. He says that the period of incubation is so variable that it has been known to last two hundred forty-six days, and the only safe rule is to kill all dogs that are suspected of having been bitten by a rabid animal at once.

THE CONTROL OF RABIES.

Experience in some of the European countries have demonstrated that this dreaded disease can be controlled by active measures on the part of those who have the power in their hands to adopt radical means in regard to its suppression; and when we consider for a moment the extreme suffering of the unfortunate victim of this terrible disease, we must naturally feel that no measures, however radical (if consistent with the laws of the state), can be otherwise than justifiable in our endeavors to stamp out an outbreak of rabies.

The complaints of suspected cases of this disease require more than an ordinary investigation, from the fact that the early symptoms of a case where an animal is suspected vary so much, and the tendency of some dog owners to give their dog all the benefit of the doubt. I believe the only rational way to handle these cases, where the owner insists in keeping his suspected dog, is to compel him to keep his dog firmly chained in a room or enclosure where neither man nor beast can come in contact with him and not allow him to be released under three months unless a laboratory test of the head of the dog that bit him does not reveal the negri bodies, or rabbits inoculated from the brain or spinal cord show signs of the disease.

In view of the fact that in every country where active measures for its suppression have been allowed to relapse for a time, rabies has invariably been known to increase. In support of this contention, I beg leave to quote an extract from a paper read by Prof. Fleming before the Seventh International Congress of Hygiene and Demography in London:

> "The value of the muzzle in suppressing rabies has been best demonstrated in the City of London on several occasions, espeially in 1885. In the previous years Hydrophobia had increased in England to an alarming extent, and nq steps worthy of note had been taken to check the mortality. For the City of London alone, no fewer than twenty-seven deaths were reported as due to bites of rabid dogs. 'A muzzling order was then enforced, and at the end of 1886, not a single death was recorded. Unfortunately, the order prescribing the use of the muzzle was then rescinded, and in a few months, a case of Hydrophobia occurred in the south of London, which was soon followed by others, and in 1889 (just three years after), ten deaths were registered. In July of that year, the muzzling order was again issued, and stringently carried out, and rabies once more disappeared."

In Sweden, where the muzzle and other radical measures were put in force, rabies has been unknown for many years, and no deaths from the disease have been known since 1870, although at one time it was a somewhat common disease, from eight to ten persons dying annually.

This being the case, is it not the duty of your Honorable Commission, with the assistance of local boards of health, to carry out the most stringent measures within your province not only for the control of this dreadful disease, but with a view to its ultimate eradication from the state; and if the laws under which we operate are inadequate, then urge upon the Legislature the necessity of enlarging your powers by enacting such sanitary measures as you deem advisable to successfully carry out the work.

Inasmuch as we already have rabies prevailing in eleven counties of this state, and those eleven counties or some part of them under quarantine, and a number of people have been bitten by rabid dogs (but fortunately have taken the Pasteur treatment in time) and a number of domestic animals have become rabid, would it not be wise to place a muzzling ordinance on the whole of the Southern Peninsula of the state for at least six months, as far as we can judge from the great increase in rabies in the past year, we are likely to have the state overrun by the disease. We here append a list of the counties and parts of counties that are, or have been, under quarantine during the past two years on account of rabies.

Areas quarantined on account of rabies during years of 1915 and 1916.

County.	Area quarantined.	Time.	
		From.	To.
	1915.		
Sanilac	Entire county	Jan. 16	Further notice
Saginaw	Entire county	Oct. 5	December 5.
	1916.		
Gratiot	Entire county	April 15	July 15.
Gladwin	Townships of Grout, Buckeye, Beaverton and Tobacco.	May 6	August 16.
Midland	Warren and Edenville	May 6	August 6.
Gladwin	Beaverton, Tobacco, Billings, Bentley, Buckeye, Grout, Sage and Gladwin	May 27	August 27.
Kent	Sparta	Aug. 1	October 1.
Allegan	Wayland, Hopkins, and the south half of Leighton and Dorr, and in village of Wayland	Aug. 12	October 12.
Clinton	S ½ of Bingham and N ½ of Olive	Sept. 28	October 28.
Kent	Alpine and township of Plainfield north and west of Grand River	Oct. 18	December 18.
Clinton	Westphalia, Riley, Olive, Victor, Dallas, Bengal, Bingham (including city of St. Johns) and Ovid	Oct. 18	November 18.
Ottawa	Georgetown, Jamestown and Allendale	Oct. 31	December 31.
Kent	Byron and Gaines	Nov. 9	Jan. 9, 1197
Ottawa	Zeeland and Holland, and cities of Holland and Zeeland.	Nov. 15	Jan. 15, 1917
Kent	City of Grand Rapids, and townships of Grand Rapids, Walker, Paris, Wyoming, Cascade, Byron, Gaines, Ada, Alpine and Plainfield	Nov. 16	Jan. 16, 1917
Allegan	Dorr and Hopkins	Nov. 21	Jan. 21, 1917
Clinton	Entire county	Nov. 23	Jan. 23, 1917
Van Buren	Townships of Lawrence, Paw Paw, Columbia and Arlington, and in the city of Paw Paw and in the villages of Lawrence and Breedsville	Nov. 24	Jan. 24, 1917
Kent	Algoma	Nov. 24	Jan. 24, 1917
Allegan	Dorr and Leighton	Dec. 5	Feb. 5, 1917
Ottawa	Townships of Polkton, Wright and Chester, and in the villages of Coopersville, Eastmanville, Conklin, Berlin, and Harrisburg	Dec. 7	Feb 7, 1917
Muskegon	Ravenna	Dec. 22	Feb. 22, 1917
Ionia	Township and city of Ionia	Dec. 23	Feb. 23, 1917

If all dogs running at large are required to wear a muzzle, they can do no harm, provided they become rabid; and if the European countries can stamp out rabies in this manner, we should certainly be able to accomplish the same condition in this state.

In closing this report, I wish to call the attention of the public to the following important facts in regard to this matter: viz., first, that all dogs or other animals affected with rabies do not act in the same manner; second, that a dog affected with the disease is not afraid of water as was generally believed; third, that, the disease does not develop spontaneously, and there is no well-marked period of incubation; that summing up the opinion of the different experimenters along these lines, both in this country and Europe, we find that it is supposed that animals become rabid after being infected, at periods varying from about twelve days to more than a year. We should also bear in mind that the Pasteur treatment is a sure preventive of the disease if taken immediately after the person has been bitten by a dog or other rabid animal, and this matter should never be overlooked or any chances taken on suspicious cases, as rabies is incurable once it gets its hold on the person.

ANTHRAX.

Anthrax or Splenic Fever, as it is sometimes termed, is an acute febrile infectious disease of domestic animals, particularly of ruminants and horses, characterized by an acute swelling of the spleen, and by serous hemmorhagic infiltrations of the subcutaneous connective tissue. The disease is due to the Bacillus Anthracis which has its habitat in the soil in many agricultural countries, but is usually confined to certain localities where the moist marsh or inundated soil is suitable for the growth of the infective agent. In some parts of the United States, the disease appears enzootically almost annually, principally among animals that pasture in the summer time, although it is sometimes observed in stable-fed animals. This Bacillus is a non-motile bacterium which multiplies by fission and also by spore formation; and forms, on artificial media, long chains. While all the domestic animals, except fowls, may be subjects of natural infection, it is more apt to occur in cattle and sheep. Man may take the disease by accidental infection from handling sick animals or other products, as hides, hair, the flesh, especially if any abraded surface comes in contact with the organism. The germs of Anthrax are of a very low resisting power, being killed in a few days by drying, and in a few minutes by ordinary disinfecitng solutions or by boiling. They are also killed by the gastric juice and by putrefaction. Exposed to the air, or in the presence of oxygen, the germ assumes the spore form, which is very resistent to either germicides, sunlight, or other substances that readily kill the germ itself.

It is this that makes Anthrax such a difficult disease to eradicate. The spores will live in the soil and on objects where they have been deposited for several years. They can be killed by boiling but in not less than five minutes, and they also require several minutes emersion in ordinary antiseptic solutions before they become inert. Exposure to freezing or bright sunlight does not seem to affect these spores.

SYMPTOMS.

In cattle and sheep, the only animals that the writer has ever had the privilege to inspect while affected with Anthrax, the disease will occur either in the acute or sub-acute form, producing death in from a period of less than an hour up to a week. The acute form which produces death usually in from six to forty-eight hours, is the most common form of the disease. In these cases, we find a high fever, 105 to

107° F., pulse ranging from 80 to 120 in cattle and usually small and weak; mucous membranes congested or cyanotic; feeding and rumination cease; the animal shows depression and weakness, occasionally with mental excitement, muscular tremors and weakness of the hind quarters. In the first stages, the animal is generally constipated, but later a diarrhea sets in and the feces is streaked with blood, and there is also a bloody discharge from the nostrils and mouth and sometimes blood passing with the urine, and swellings sometimes appear on different parts of the body.

This disease can rarely be diagnosed with certainty except by microscopic examination of the blood, liver and spleen for the Bacillus. This examination must necessarily be made soon after death, as the process of putrefaction will cause the death of the germs. To assist in this diagnosis, the inoculation of guinea pigs or rabbits should be resorted to.

We frequently find the subcutaneous tissue infiltrated with serous or bloody fluid, lymphatic glands enlarged and congested, and the spleen about five times its normal size. The liver is usually congested and sometimes enlarged, and the contents of the intestines often bloody and the mucous membrane thickened; lungs hyperemic and infiltrated with gelatinous material; the blood is usually thin, almost black, and does not coagulate.

It is not advisable to attempt curative treatment in cases of Anthrax, but the sick animals should be destroyed at once and the carcasses either burned or covered with quick lime and buried very deeply.

Preventive treatment is very efficacious. This consists in sanitation and protective vaccination. For several years, different ways of preparing the vaccine for Anthrax have been adopted, either by using an attenuated virus or a dead virus in preparing the vaccine. Within the last year, a serum has been developed which seems to have a thorough prophylactic effect; also a spore vaccine has been developed which is producing good results. In case of suspected Anthrax, it would be well to apply this vaccine at once to all the animals that do not show signs of the disease, and even to those that have only a slight rise of temperature; but the very sick animals should be destroyed at once and the stables, or place where they have died, should be disinfected with a very strong germicide. The great danger of the spread of Anthrax in the herd is where you have bloody discharges; then the danger is very great. If several animals of a herd are afflicted at once,. it is more likely that the infection came from a common source than that one animal contracted it from another. The feces may contain the germs if they are blood-stained, or if there is ulceration of the bowels, and in such case would be very infective. This protective inoculation was first worked out by Pasteur in 1882, as from studying the disease among various animals it was noticed that one attack of the disease protected an animal against a second, where an animal had been fortunate enough to survive the disease in the chronic form. In this way, Pasteur began preparing the immunizing fluid by attenuating the germ to a certain extent with heat. Since that time, many research workers have been endeavoring to work out a vaccine that could be used in the field and could be depended on to give more certain immunization. The Bureau of Animal Industry at Washington, D. C., has apparently perfected a spore vaccine that can be relied on to produce complete immunization.

This will certainly have the effect of minimizing the losses from Anthrax to a great extent, and by the use of this vaccine as a prophylactic in the herd, the disease may be prevented.

DISEASES OF SHEEP.

During the last year, few cases of infectious diseases have occurred in the state among the sheep. The most destructive disease, however, is that of intestinal parasites, which can be eradicated if proper treatment is applied, and the old pastures which have been used for grazing purposes for years past are broken up and new pastures used for grazing the flocks, so that they will not become infected from this source. There are many shipments of Western sheep coming into the state for feeding purposes, and the usual amount of losses occur from the long journeys and exposures which are occasioned by this shipment. I cannot help but feel that this is one branch of our agriculture which should be encouraged, as we have lands suitable for grazing purposes not only in the Upper Peninsula of Michigan, but in the northern part of the Lower Peninsula as well. Those who have tried out this project are meeting with unbounded success and are reaping a reward for their efforts.

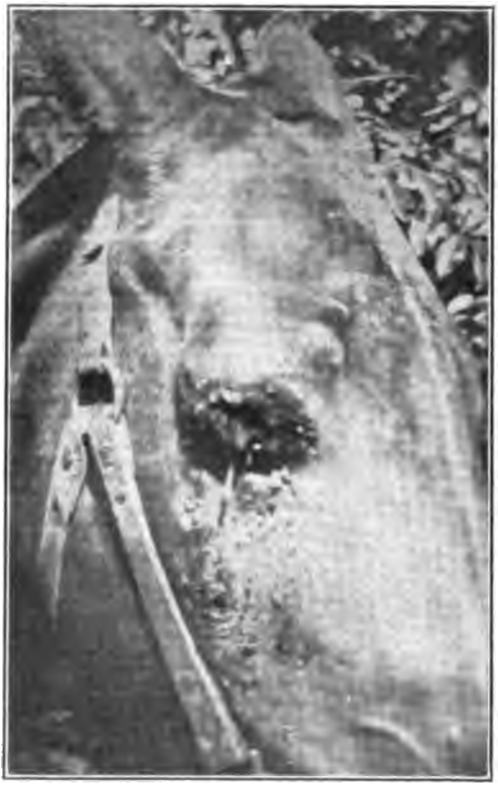
DISEASES OF HORSES.

Among the contagious, incurable diseases of horses, glanders has been the only one that has prevailed in the state, as far as is known, in the present year. This is a contagious, constitutional disease, confined entirely to horses, asses and mules, but at the same time communicable to man, dogs, cats, rabbits and guinea pigs. It runs a variable course until it causes the death of the animal affected with it. It is subject to many complications, affecting the lymphatic glands, the lungs, or in fact any of the internal organs, and shows itself in the form of pharcy, affecting the subcutaneous connective tissue.

In order to understand the different forms of glanders that may be found in a stable where a number of animals are affected, it must be understood that glanders and what is known as Pharcy are the same disease, differing only in that the term glanders is applied when the disease is shown in the air passages in the lungs, accompanied by a discharge from one or both nostrils; and the term pharcy is applied when the principal lesions are shown in the skin and superficial lymph glands.

This disease is found in the most insidious forms, can exist for some time without showing any apparent effect on the animal, and in many cases it shows no symptoms that would enable the most experienced veterinarian to make a positive diagnosis by a physical examination. However, where there is any suspicion of the disease, the mallein test can be applied. This test consists in injecting pure cultures of the germs of glanders, that have been properly sterilized, either under the skin or placed in the eye; and if an animal is free from glanders, we get no results; but in the event of glanders being present, symptoms are usually developed that make it plain to the observer that the animal is diseased.

The symptoms of glanders are many and varied, a number of them closely resembling symptoms of other diseases. None but the careful



This horse was given the ophtho-mallein test for glanders, and shows a typical reaction by the discharge from the eye.

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veterinarian should attempt to differentiate between glanders and other eruptive diseases, as a mistake made in this way might be the means of keeping a chronic glandered horse in the stables where the disease might be spread to an extent that would be a great loss to the horse owner, and develop conditions that might be dangerous to the man in charge.

Several instances have come under my observation where a horse affected with chronic glanders in a mild form has escaped the notice of the owner until a number of his stable companions have become affected with the acute form of the disease.

This should teach us that eternal vigilance is necessary in the control of this disease, as one glandered animal brought into the state was the means of producing an outbreak that necessitated the destruction of a number of first-class animals. I am very glad to report that our Live Stock Sanitary Law has been amended to such an extent that horses are not allowed to be shipped into our state, either as breeding or work animals that are expected to remain in the state, unless they are tested with mallein and proven by this test to be free from the disease. This amendment to the law will certainly have a tendency to aid us in the elimination of glanders entirely from the state. We wish to emphasize the fact that when glandered animals are destroyed, they should be either burned or buried very deeply. The carcass should be covered with quick lime at the time of burying, and should be kept out of the reach of dogs or other carnivora that become susceptible to the disease. A case is recorded where a pack of wolves in the Philadelphia Zoological Gardens died within a short period from glanders after being fed the meat of a glandered horse. The fact that dogs and cats in a great many instances are the playmates of children, the greatest caution should be exercised in caring for the carcasses of glandered horses so that they are entirely out of reach of these animals. I take pleasure in being able to report that within the last two years we have had very little glanders to contend with in this state, and I believe now that we have a law protecting us in the importation of all horses that we will soon succeed in its elimination entirely from this state.

Before completing this report, I wish to call the attention of the Commission to the fact that a suitable laboratory is very much needed to facilitate the work of diagnosis of contagious and infectious disease; as costly and dangerous outbreaks of obscure diseases frequently occur that can only be demonstrated by laboratory methods.

A suitable laboratory, with a competent Pathologist, is an absolute necessity in giving the live stock industry the protection that its large and ever increasing interest entitles it to at the hands of this Department.

Section 4 of the Live Stock Sanitary Laws of the state provides that the Commission shall provide proper facilities for the State Veterinarian, and a laboratory for the investigation of infectious diseases; but owing principally to not having suitable room for the purpose, this important phase of the work has not been carried out. I feel satisfied that the great expense of the outbreak of foot and mouth disease caused your Honorable Commission to hesitate at the increased expense that a laboratory would entail, at that time. It was certainly a commendable measure of economy, but it is the opinion of the writer that a properly equipped laboratory would be an economical investment to the state at large, owing to the important bearing that the health of the live stock has on the future products of this great commonwealth.

In many cases, a certain and expeditious diagnosis may have an important bearing on the health of the individual as well as the animal, especially in such diseases as rabies where the early treatment of the infected person is necessary to prevent one of the most dangerous and terrible diseases.

In concluding this report, I wish to express my thanks to the Commission for the very courteous treatment that I have received while carrying out the duties of my position. I also desire to thank Dr. E. T. Hallman, our Pathologist, for the very able assistance that he has given us at all times. I also wish to express my thanks to the State Bacteriologist, Dr. Ward Giltner, for the very cheerful and important assistance rendered whenever he was called on by this Department.

Respectfully submitted,
GEORGE W. DUNPHY,
State Veterinarian.

MICHIGAN AGRICULTURAL COLLEGE.

East Lansing, Jan. 10, 1917.

DEPARTMENT OF PATHOLOGY.

Hon. H. H. Halladay, Pres., State Live Stock Sanitary Commission, Lansing, Michigan.

Dear Sir:—I herewith submit results of animal tissues examined for the State Live Stock Sanitary Commission for the two years ending December 31, 1916. This record does not include specimens addressed direct to the Pathological Department of Michigan Agricultural College, many of which no doubt should be credited to the State Live Stock Sanitary Commission as it is widely known that the head of the Pathological Department is also Pathologist to the Commission.